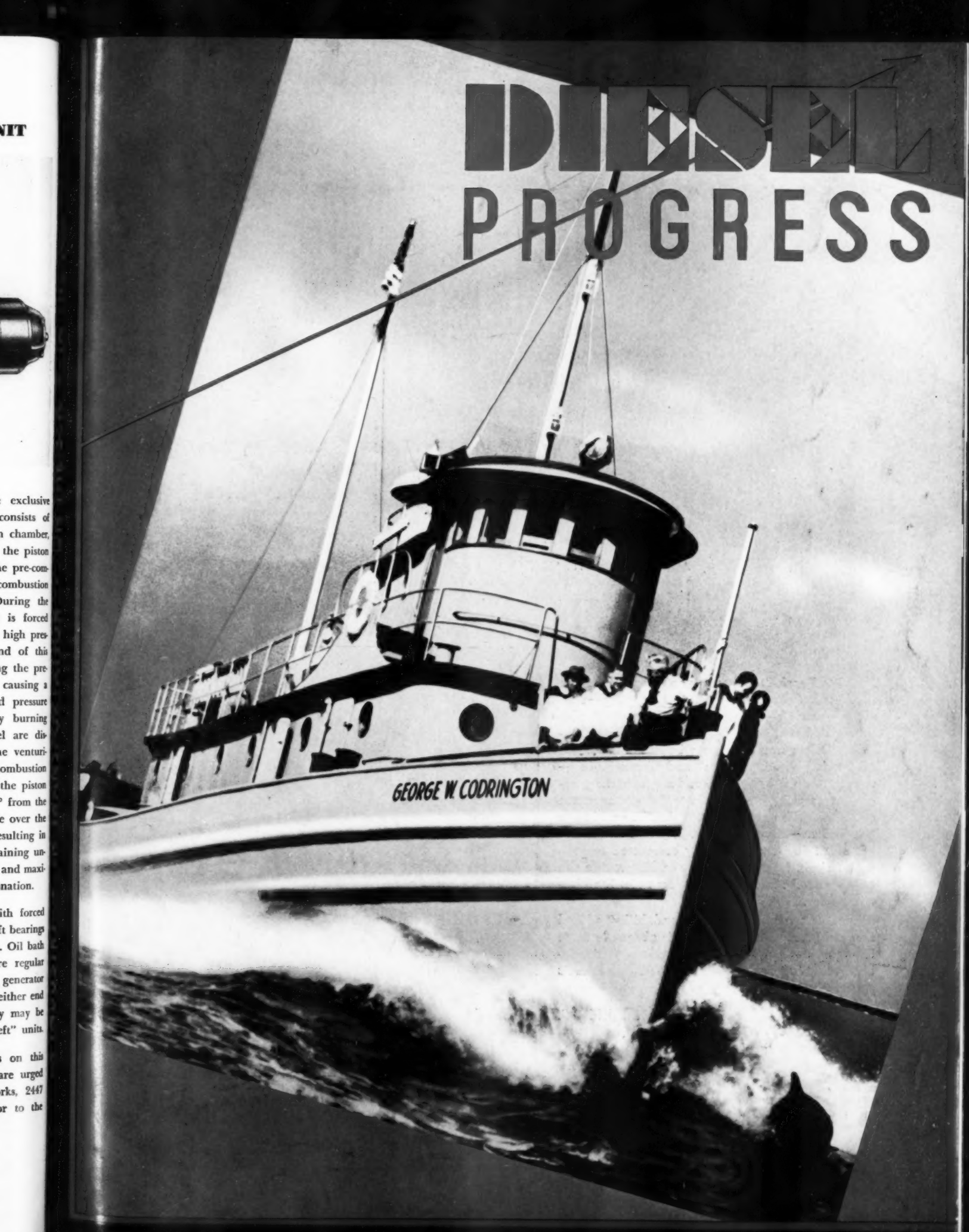


DECEMBER, 1940 CIRCULATION OF THIS ISSUE—IN EXCESS OF 14,000 COPIES 25c

IT'S SOUND BUSINESS TO STICK TO BUSCH-SULZER DIESELS

Aerial view of M. S. "KALAKALA"—World's First Streamlined Ship. Powered by 3000 S.H.P. Busch-Sulzer Diesel.

Operating company after operating company have found it so. For one—the Puget Sound Navigation Company. Look at the record of the "Chippewa" which now has close to a *million* Diesel miles . . . the "Kalakala" with well over a *half million.* Both motor ferries *have never lost a single day of service* due to engine failure or breakdown since original installations, 1932 and 1935 respectively.

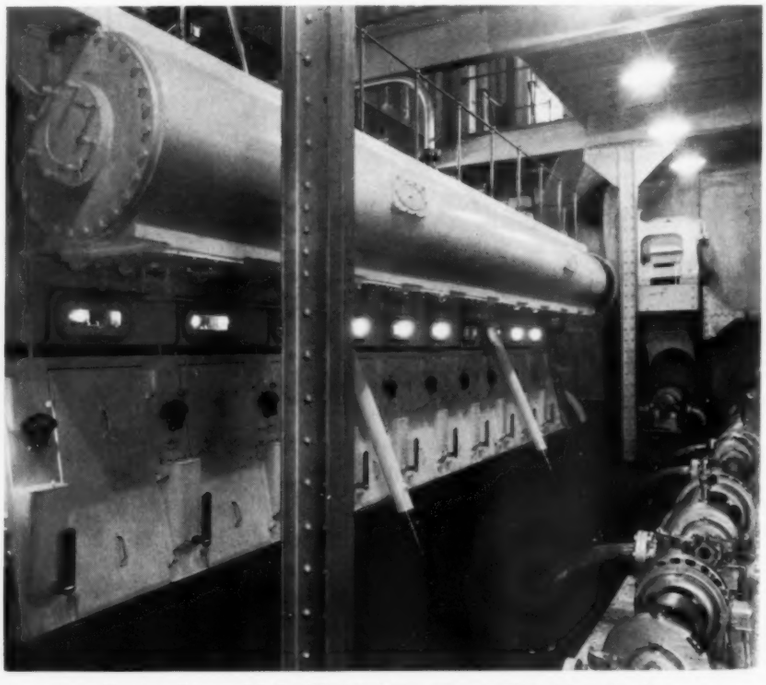
Two More for the Seattle-Bremerton Run

NOW, to Busch-Sulzer comes another order from the Puget Sound Navigation Company—two more Busch-Sulzer Diesels of the same type as those propelling the "Chippewa" and the "Kalakala." These new engines will be used for the conversion of the "Fresno" and "Santa Rosa"—to provide increased speed and augment the present ferry service from Seattle to Bremerton. Both engines will be rated at 2800 S.H.P.—will have 8 cylinders — 20½ bore x 27½ stroke — will operate at 240 R.P.M. directly connected to propeller shaft. Busch-Sulzer also will provide the two 450 H.P. Diesel generating units for electric power.

Wouldn't you say that "Dependability" played a prominent hand in signing this new order? For lower operating costs, for smooth-running, trouble-free miles, you'll find that Busch-Sulzer Diesels *pay* as they go—and they go *farther.*

BUSCH-SULZER BROS.— DIESEL ENGINE CO.

America's Oldest Builder **of DIESEL ENGINES**



Engine Room M. S. "Kalakala"—3000 S.H.P. Two-Cycle Trunk Piston Mechanical Injection Propelling Engine

BUSCH-SULZER
ST. LOUIS

DIESEL PROGRESS and DIESEL AVIATION

REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: New Diesel-Electric Tug *George W. Codrington* on trials off Port Arthur, Texas. Note playful young porpoise at the bow. See article on pages 24, 25, and 26.

TABLE OF CONTENTS ILLUSTRATION: Typifying the wide use of Diesel engines in interstate trucking is this photograph of a General Motors cab-over-engine Diesel truck hauling a Fruehauf trailer on the Chief Lines of Kansas City, Missouri.

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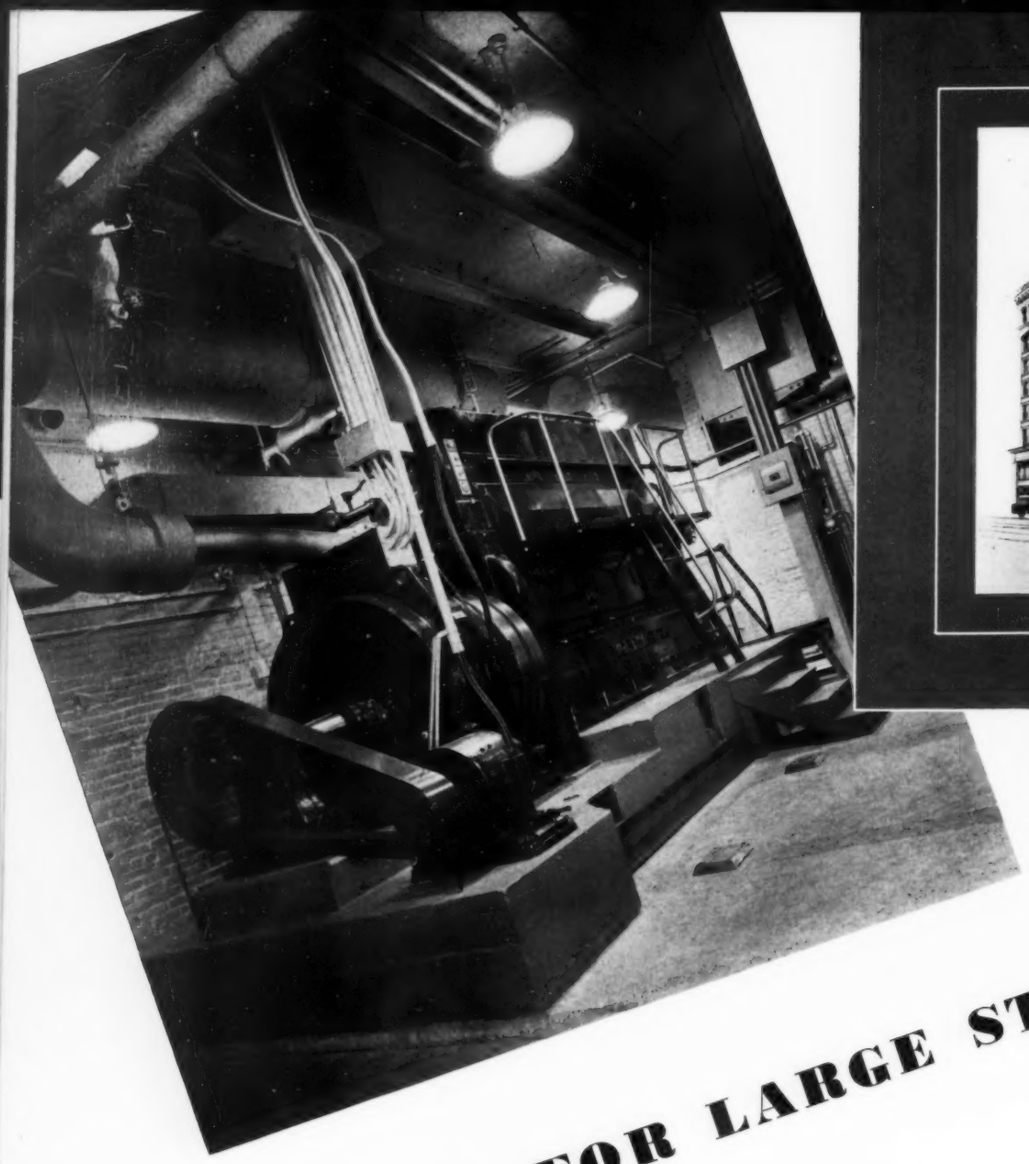


The huge Forbes & Wallace department store in Springfield, Massachusetts.

The Diesel generating set recently installed in this store.

DIESEL FOR LARGE STORE

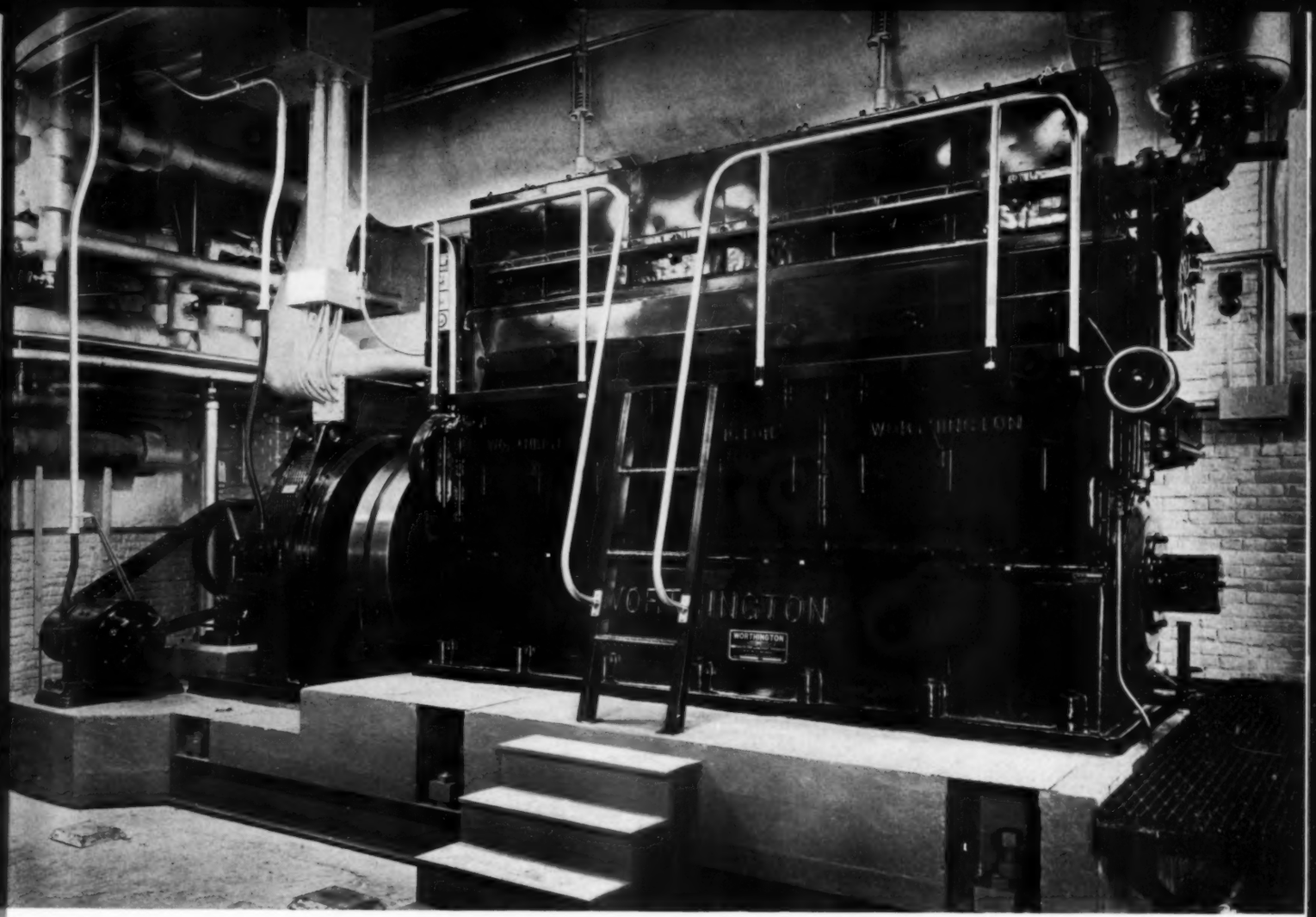
By GEORGE D. CROSSLEY

IN THE heart of downtown Springfield stands the Forbes & Wallace department store, known for many years not only as the city's largest mercantile establishment, but as the largest store in western Massachusetts. To this distinction has now been added that of being the first property in Springfield to install modern Diesel generating equipment. To borrow a now famous phrase, it could not possibly be the "long arm of coincidence", but rather the vision of progressive management that places this widely known store in such prominence.

Down through the years the varied electrical requirements of this complex institution have been supplied by three steam-electric generating units: an Ames and two American Ball compound engines in combination with the utility. And since large quantities of steam are required for laundry, restaurant, two cafeterias, three garment presses, and two hydraulic elevator pumps, as well as heating, it is likely that one of the steam engines may be kept in service indefinitely. There are periods, however, during which the electrical and steam requirements are badly out of balance, and it has long been felt by Chief Engineer L. C. Hastings that exhausting steam into the atmosphere was like paying for something and not having it.

So it may be said that the steam, which is no longer being wasted, is helping to pay for the new Worthington Diesel and Crocker-Wheeler generator, which went on the line some three months ago to supply the electrical requirements of the basement, first, second, and eighth floors, including a cafeteria and auditorium. The Diesel is rated 340 hp. at 450 rpm., being a 6 cylinder, 4 cycle unit of 10¾″ bore by 14½″ stroke. Direct connected is the 225 kw. alternator with its 7.5 kw. exciter V-belt driven from the generator shaft extension.

Characteristic features of the Worthington Diesel are complete enclosures, which are arranged for easy access to all operating parts. The cylinder heads are of the cone type developed by Worthington to achieve strength



Seen in this view are the Korfund Vibro-Isolator adjusting units recessed in the engine-generator base; the Maxim exhaust silencer, above the engine; Burgess intake Snubber, upper right; and Woodward governor, upper left.

and freedom from expansion strains. Both intake and exhaust valves are made of austenetic steel, fitted in removable cages, and the exhaust valve cages are connected to the cooling system. The exhaust manifold is completely water-jacketed.

The Diesel and generator, located in the store basement, directly below the first sales floor, are mounted on a common foundation which rests on river silt. Between the sub-base and the engine bed is a Korfund steel spring Vibro-Isolator, the effectiveness of which is nothing short of remarkable considering the type of sub-soil. The total measured vibration of the engine-generator mass is within .002" and a coin will balance on edge on any flat surface where draft from the ventilating duct does not blow it over. Vibration of the unit itself is imperceptible, can neither be seen nor felt, and operating frequencies are completely isolated from all parts of the store building as well as neighboring properties. To put it definitely, this is clearly a most thorough job of isolation. Equally effective is the handling of exhaust through a Maxim Silencer, and intake through an Air-Maze filter-silencer, air being taken directly from the engine room. Thorough protection of the engine is insured by an Alnor 6 point exhaust pyrometer, Woodward isochronous governor, Manzel multiple force feed lubricator, Cuno fuel and lube filters, and Viking oil and water alarms. A Worthington evaporative cooler, installed in a small offset in the adjacent boiler room, is connected to the closed engine jacket cooling system. An interesting feature of the cooling arrangement is that make-up water is condensate from the boiler return trap.

A Worthington two-stage starting air compressor is arranged for either motor or gas engine drive. Fuel is transferred from a 15,000 gal. underground tank by a Worthington gear type pump, through a meter of the same make, to a 200 gal. day tank in the engine room. Simplicity and thorough engineering are the outstanding qualities reflected in this history-making Diesel installation down to copper piping and bronze valves throughout.

The first full month's operation record shows a total of 43,300 kw. generated at a cost of 4.7 mills per kwh. on fuel consumption of 11½ kw. per gal. and a total cost of $218.68 for fuel and lube oil, respectively, a good showing by any comparison and well within Engineer Hastings' estimates to his management.

This interesting plant was designed by and installed under the careful supervision of Charles H. Craig of the engineering firm of McClintock and Craig, Inc., Springfield. It is interesting on several scores; first, because its success, already demonstrated, assures the installation of an identical unit in the Forbes & Wallace store, the foundation for which is already in place; second, it is a tribute to fine engineering and foresight.

George W. Codrington, head of the Cleveland Diesel Engine Division of General Motors, dons overalls and becomes a Chief Engineer for a day to run trials on this new tug, which has been named after him.

GEORGE CODRINGTON AGAIN BECOMES CHIEF ENGINEER FOR A DAY

GEORGE W. CODRINGTON, head of the Cleveland Diesel Engine Division of the General Motors Corporation, dusted off his Chief Engineer's papers, donned a suit of overalls and ran the official trials of this, the last word in Geared Diesel-Electric Drive Tugs. The trials started from the dock of the Gulfport Boiler & Welding Works on the Port Arthur Ship Canal and were completed out in the waters of the Gulf of Mexico.

Mr. Codrington came up to his present high position the hard way. Back over the years he has worked on every job in a ship's engine room from oiler to Chief Engineer, and well earned his Chief's license issued by the United States Department of Commerce to serve on any vessel, regardless of size.

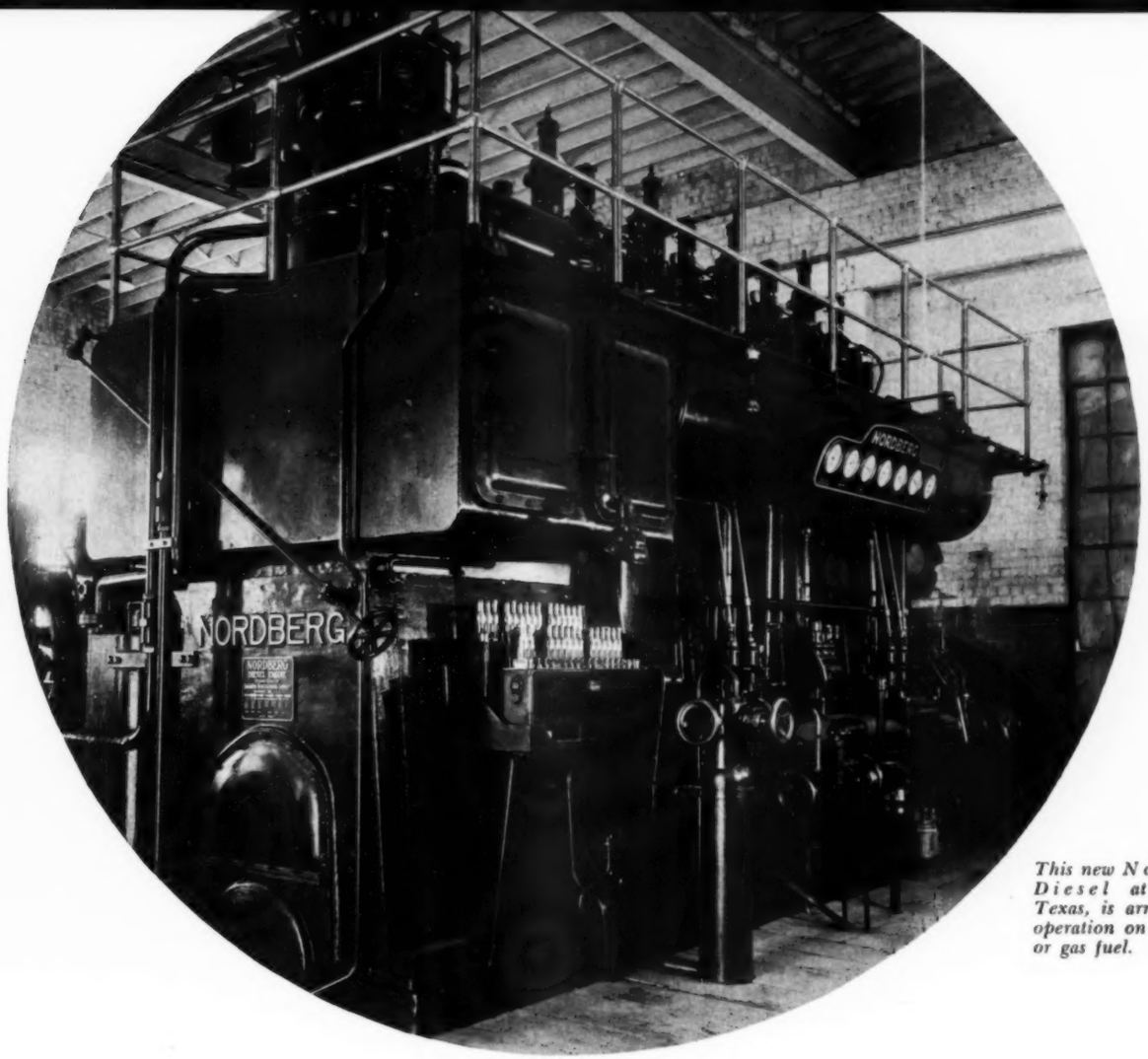
One of the most practical men in the Industry today, because of his actual working knowledge of requirements in the engine room of many different types of ships, he has contributed tremendously to the successful application of Diesel engines to every type of ship propulsion. He is the father and chief proponent of Diesel-Electric Drive for ships in this country. For twenty-five years he has fought, in season and out of season, for the Diesel-Electric Drive idea. It was a proud day for him, here today in Port Arthur, Texas, to don overalls and run the engines in a fine, new 1000 shaft horsepower Diesel-Electric Tug carrying his own name: a fitting compliment to a man who has done so much to foster and expand the demand for and sale of Diesel powered vessels of all types and sizes.

The tug itself is a fine example of the modern art of welded steel construction, rugged and strong. Inasmuch as forced draft ventilation is used throughout the ship, the decks, etc., are clear of ventilators, tending to make the handling of the vessel easier and safer.

Crew's quarters are exceptionally comfortable and well laid out. There is complete intercommunication between all parts of the ship without the necessity of going out on deck in bad weather. The galley extends the full width of the deckhouse, is well lighted, well ventilated and equipped with every last gadget for preparing good food and serving it well.

The *George W. Codrington* splendidly typifies the type of steel tug which is coming out of the Gulf Coast shipyards: An all-welded steel ship built to the requirements of the American Bureau of Shipping, designed by George B. Drake, New York Naval Architect, and constructed by the Gulfport Boiler & Welding Works, Inc., of Port Arthur, Texas. All plating and structural members are of mild open-hearth steel, with every joint welded together by the electric metallic process. The vessel has an overall length of 102′ 2″, a molded beam of 24′, and a molded draft of 12′ 4″. The total fuel capacity is 520 barrels and the lubricating oil capacity 400 gallons.

Complete propulsion machinery of the *George W. Codrington*, including main and auxiliary



This new Nordberg Diesel at Vernon, Texas, is arranged for operation on either oil or gas fuel.

ANOTHER DIESEL FOR VERNON, TEXAS

By ORVILLE ADAMS

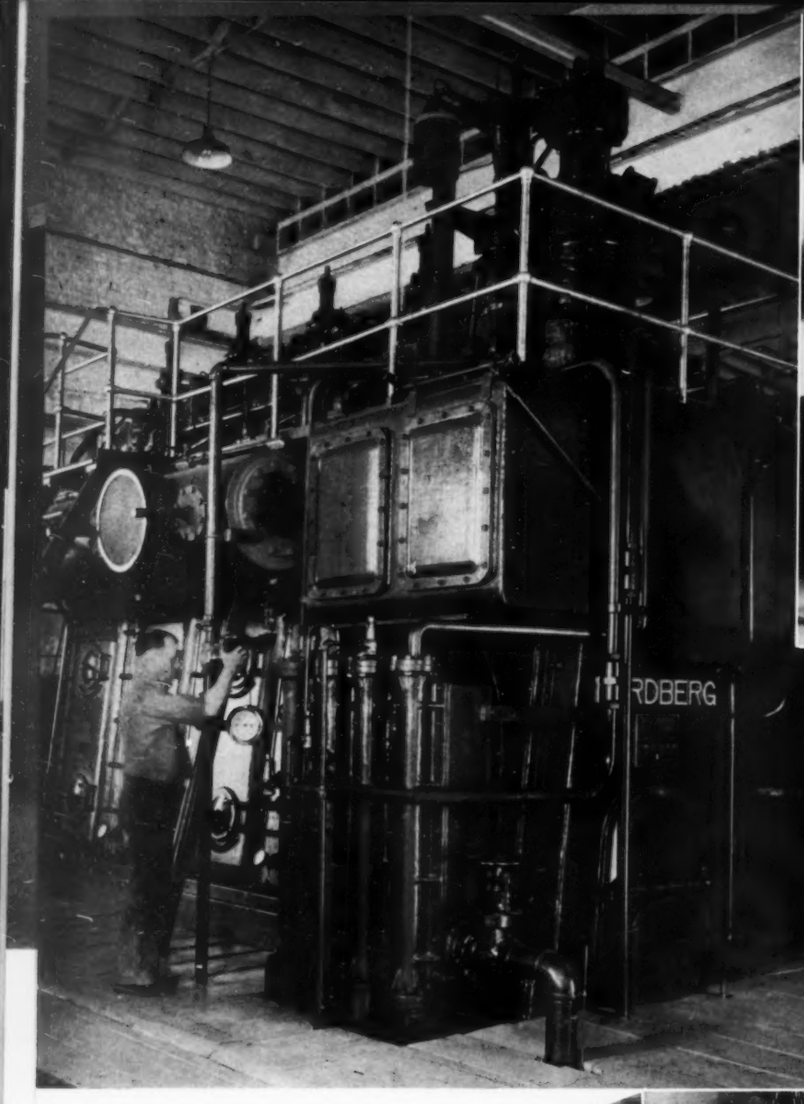
TWENTY years ago, the Vernon, Texas, Municipal Power plant was launched at an initial cost of $45,000 with the installation of one 300 hp. Diesel engine. The load and the capacity of the plant have developed consistently and, at the present time, it has a total installed horsepower of 3400, approximately eleven times the original capacity. The investment now represents more than a half a million dollars, and there is no outstanding indebtedness. With the addition of a new engine, a Nordberg Air Injection, Gas Injection Diesel, which started operation early this year, the plant is now operating at the lowest cost in its history.

The new engine has a bore and stroke of 17″ by 25″ and is rated at 1060 hp. at 257 rpm. when operating on oil, and is rated at 900 hp. when operating on natural gas. The operating record for the present year indicates an average fuel consumption of about 11.5 cu. ft. of natural gas per kilowatt hour generated. With proper correction for altitude, the figures show that the fuel consumption is less than 10,000 B.t.u. per kilowatt hour. The fuel oil used for pilot ignition averages 19,250 B.t.u. per pound, and the natural gas approximately 1000 B.t.u. per cu. ft. at sea level and standard conditions.

The plant generated 4,538,430 kw.hrs. in 1939, and at the rate of growth for the past ten years, the production for 1940 will exceed 5,000,000 kw.hrs. The record of three typical months of operation for the new engine during 1940 is as follows:

Hours on the line	1992
Output, production.	654,730 kw.hrs.
Cu. ft. natural gas	7,577,900 cu. ft.
Pilot oil	5,989 gal.
Gas consumption, ave.	11.57 cu. ft. per kw.-hr.

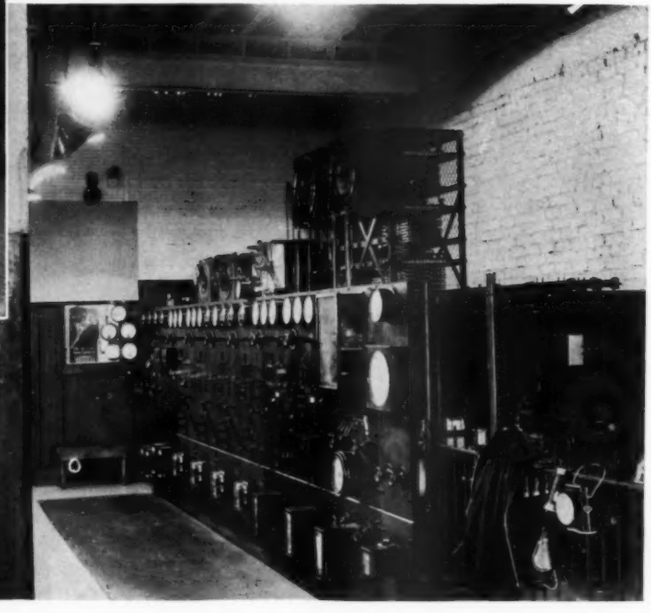
The new engine at Vernon is a Nordberg, four cylinder unit, and is rated at 900 hp. on natural gas. It is the well-known two-cycle air injection type and cross head construction, with oil cooled pistons. The engine's three stage injection air compressor for air injection, when operating on oil fuel, compresses the natural gas instead of air when operating on

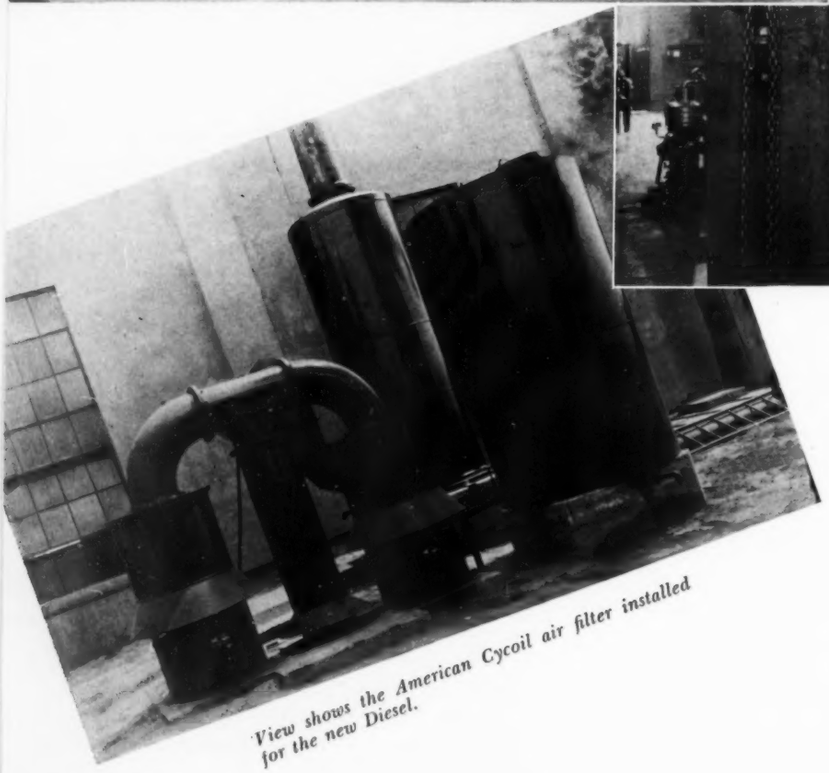


↑ *General view of the Vernon plant.*

← *Compressor end of the new Nordberg oil and gas Diesel*

↓ *View showing the switchboard. Note the DeLaval centrifuge in lower left of picture.*





View shows the American Cycoil air filter installed for the new Diesel.

gas. The gas supply is brought to the engine compressor suction side at around 50 lb. pressure, and is discharged from the high pressure side at approximately 1100 lbs. per sq. in. into a common high pressure line. From this header, the gas is admitted to the individual cylinders through injection nozzles equipped with variable lift needle valves.

Smooth operation and reliable combustion is obtained by means of the use of a pilot quantity of fuel oil injected with the natural gas. This fuel is called the pilot oil. The Bosch injection pumps for each cylinder, when operating as a Diesel, send the fuel to the fuel injection valves. When the engine is arranged

for gas injection, these pumps are connected in such a manner as to lift fuel valve actuators. The fuel pump is arranged to pump lubricating oil instead of fuel. The hydraulic valve actuator plunger is connected to the injection valve lever which lifts the needle valve and admits the charge of compressed gas from the high pressure line to the combustion chamber.

Since no major change is made to the cylinder when burning either oil or gas, the engine is equipped with the same pistons, injection nozzles, cylinder heads, connecting rods, etc., for operation on either fuel, and all the equipment used for the liquid fuel is retained when operating on natural gas, the gas being ignited solely by the heat of compression, which makes it unnecessary to employ spark plugs, as in the Otto type of engine.

The chief advantage of the dual fuel burning Diesel is its low cost of producing power in regions where there is an abundance of cheap, natural gas available and therefore preferred to oil from the standpoint both of economy, reliability of supply, reduction in storage capacity, and cleanliness in and around the plant. It has the added advantage, however, that should there be any interruption of the gas supply, the engine can be converted to burn oil in a few hours, and still maintain the low cost power production that is the outstanding advantage of the Diesel engine.

The Vernon plant receives oil fuel by rail or truck where it is delivered to an underground fuel storage tank of concrete construction. Facilities have been installed for accurately metering and adequately filtering the fuel oil.

A hot water coil system is embodied in the fuel tank and supply lines near the suction end of the transfer line, which assures warm fuel and even flow of clean fuel to the day tanks in the engine room. The natural gas supply for the gas burning engine is brought to the plant by the utility, and the intake gas system is properly controlled by the usual regulators and piping system. The gas is sold to the plant for around 14½ cents per thousand cubic feet, with proper adjustment for altitude and temperature correction factors.

The usual adjuncts and essential auxiliaries required for reliable Diesel operation and economy are included in this installation. The engines are equipped with the necessary pyrometers, gauges, isochronous governors, temperature indicators, bearing pressure gauges, air filters, silencers, fuel and lubricating oil filters together with many safety devices, such as oil cooled pistons. The engines are regularly indicated and provided with periodic check for economy and efficiency.

Cylinder cooling water is protected by a closed cooling system, with softening treatment by means of a Permutit water softener, and with a small amount of evaporation, the water is continuously used without any contact with the outside air, which obviates contamination and scale formation in the engine jackets and piping system. The raw water system is handled by means of Binks spray nozzles for the cooling pond, which is an adequate storage reservoir that assures an adequate raw water source.

A noticeable feature is the air filters and the exhaust system for the new engine. This represents the advanced practice with these auxiliaries, which include an American Cycoil air filter, an oil bath type now developed for the largest installations under adverse, dusty conditions which prevail on the great plains during the dust storms. The exhaust system is correctly designed for the local condition and results in quiet operation of this engine.

The lubricating oil system is adequately provided with auxiliaries to take care of ample lubrication of the engine and piston cooling. The lubricating oil in the crankcase after months of use is very clean and free from contamination which usually accompanies Diesel operation on fuel oil, another particular advantage of the natural gas burning Diesel. This engine is fitted with a Manzel lubricating system. The oil is continuously filtered through a Nordberg twin strainer, and a De Laval centrifuge is used in this plant.

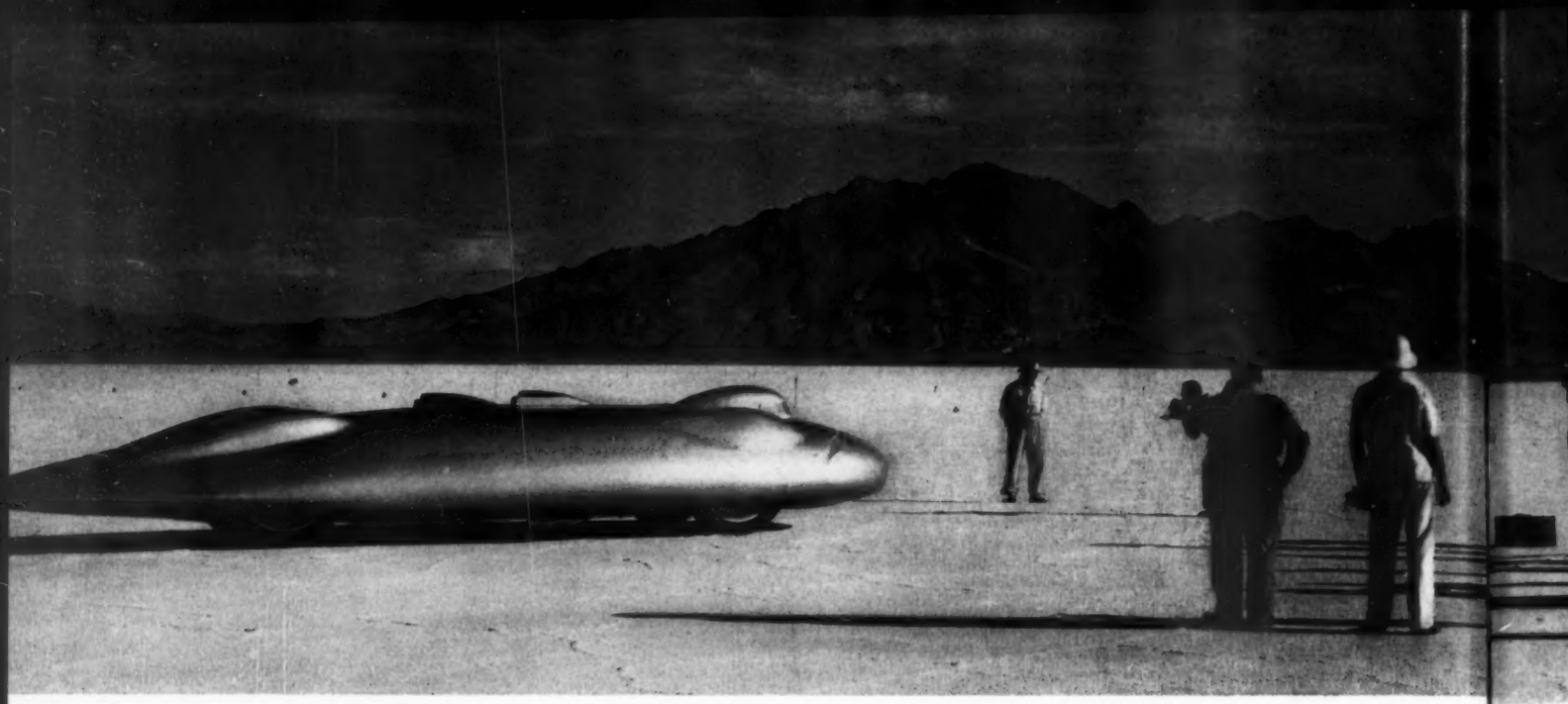
The switchboard and electric equipment is the modern type, with essential instruments. These include the synchronizing devices for paralleling the various units in the plant and voltage regulators. Watt-hour meters and recording instruments provide full information on the operation of the engine, all of which is recorded automatically. The intake air filters of the impingement type are used on the Fulton engines, and the Cycoil for the new engine. The lubricating oil is reclaimed by a De Laval centrifugal purifier, and a Cuno edge type of filter is also used on the engines. The fuel used is first passed through a Nugent filter. Then to the strainers near the injection pumps. Lubricating oil is cooled through the Schutte & Koerting oil coolers of the regular design. A Permutit water softener has long been used in this plant. Brown and Alnor pyrometers are used, as well as Dayton Dowd pumps and General Electric Motors, for the circulation of the cooling water. A series of Viking pumps is used in connection with the fuel handling, storage and transfer to the day tank supply system. A Maihak Diesel indicator is used here.

Vernon's power plant building is modern, roomy, and attractive, and is well ventilated and lighted and affords a good margin of space for the engines and the addition of future units which will replace the older smaller engines in the near future. The building is a combination brick and concrete structure with steel framing, with the various units arranged side by side with ample space between them as shown by the interior view. The engines are served by an overhead electrically operated Chisholm-Moore crane and hoist.

The net kilowatt output of the plant was 2,224,200 kw.-hrs. in 1929, 3,000,000 in 1934, 3,522,900 in 1936, and is estimated at 5,000,000 for 1940. This increase has required efficient operation as well as the installation of new engines since that time. The following is a chronology of these installations:

1 1000 hp. Nordberg oil and gas Diesel, 257 rpm., 1940
1 625 hp. Fulton Diesel, 225 rpm., 1936
1 625 hp. Fulton Diesel, 225 rpm., 1934
1 500 hp. Fulton Diesel, 225 rpm., 1928
1 360 hp. Anderson Diesel, 257 rpm., 1926
1 300 hp. F-M Diesel, 257 rpm., 1924

This record indicates the gradual growth of the plant to meet the demand occasioned by population growth and the development and increased use of current.



The unusual racing car owned by John Cobb, sportsman of London, England, who established a new record of 368.85 miles per hour on the Bonneville Salt Flats, Utah, August 23, 1939.

STATE LINE SERVICE

NOT so long ago, a London sportsman named John Cobb arrived at Wendover, Utah, with a unique, turtle-like contraption. There, on the Bonneville Salt Flats for the next few days, the brightly painted machine did much roaring up and down under the hot Utah sun. At night, it disappeared into the doors of the State Line Service Station, where an army of mechanics tinkered, checked, and corrected its complicated mechanical interior.

Then, one morning, everything was set, and Mr. Cobb took his pet out onto the flats. Climbing in, he closed himself into the little, bulbous, glassed cockpit and setting to work, he started down the speedway. It took him a while to get going, but when he did, no man alive had ever seen anything like that which took place that morning.

John Cobb roared his mechanical turtle across the Utah desert at a speed so great that the naked eye saw it only through a blur. Electrical clocking devices had recorded the fall of the old world's automobile speed record, as the turtle began to slow down after its dash across the measured course. When the machine went back to the State Line Service Station that night, it took with it a new official record—368.85 miles per hour!

Several times before, W. F. Smith's State Line Service Station has been the host and caretaker for record breaking speedsters, and Mr. Smith's belief in the dependability and economy of Diesel motive power has been largely responsible for these dashes. He knows his machines, too, for the cafe, run in conjunction with the service station, is a great gathering place for racers and their mechanics; and the man in charge of the station's power plant has had his hand in on the repairing of the fastest racing cars in the world.

Back in the engine room of the Service Station there are three Caterpillar Diesel 60 hp. engines driving electric generators. Two units are in almost constant service, with the third carrying peak loads and standing by for emergencies.

The power plant has a widely varying load to handle for, during the day, it provides all refrigeration for the Service Station and for the several auto cabins, the cafe, etc., which are operated in the settlement. It must also provide power for garage equipment and miscellaneous machines, which do routine jobs, as well as tend to the racing cars so frequently housed on the spot. At night, it must also give light for the entire small community.

Sometimes only one engine is needed; and sometimes all three. When the load is lightest, Mr. Smith finds it much more economical to be able to shut down two units, and have one running at full capacity, than it would be to have a single large engine operating at only 33 per cent capacity.

Since the Diesel plant was installed, electricity has been generated at less than two cents per kilowatt hour, including repairs and maintenance. The repair figure is almost negligible, too, because the two older engines have run more than 14,000 hours apiece without requiring any repair expenditures at all. Each unit is started by a small, gasoline starting engine and each is cooled by its own standard radiator. Both starting engine and Diesel engine exhaust are muffled and piped through the ceiling. Fuel oil is fed by the built-in transfer pumps on each engine from a common storage tank. Engine and generator mounting is comparatively simple, as neither vibration nor noise were prominent problems.

The three Caterpillar Diesel-electric generating units which furnish current for power, refrigeration and lights for the State Line Service Station.

These Diesels are operated alternately for 100 hour periods each. Running twenty-four hours a day at a cost of 2c per kwh., including cost of repairs and depreciation; two of these engines have operated a total of 14,000 hours. each, without repairs.

General view of State Line Service station and hotel.

BRYAN, TEXAS

By ORVILLE ADAMS

THE Bryan, Texas, municipal power plant has been making notable Diesel history for more than three decades. It is one of the oldest and best known Diesel generating plants in municipal service in the Southwest, having started operation with one of the earliest makes of American Diesel engines, a type A Busch-Sulzer engine which was only recently retired from service.

Bryan is the home of the Texas Agricultural and Mechanical College, and is a city of 12,000 people. The town has experienced a steady and continuous growth for decades, with the result that the load and installed horsepower has been increased to meet this demand. In recent years, about 300 miles of R.E.A. lines and 1000 rural customers have been tied onto the municipal plant. The load on the Bryan plant averaged about 3¼ million kilowatt net for the years between 1930 and 1936. Since that time, however, the load has exactly doubled, with a net kilowatt output of 6,632,200 in 1939. The REA load is more than a million kilowatt hours per year and is rapidly increasing.

During the 1920's, three Busch-Sulzer engines were installed, beginning with a 520 hp., 19 x 26, four cycle air injection engine in 1923; a 600 hp., 6 cylinder, air injection engine in 1926. A duplicate of this unit was installed in 1929. These and the older Diesel engines handled the load until 1937-38 season, after which two engines, each a 1000 hp. Busch-Sulzer air injection Diesel, were installed, the first in 1937 and the latter in 1939. The total installed horsepower now in service is 3720. The new engines are the 16¼" x 24½", 8 cylinder, air injection, four cycle, at 257 rpm. These engines are identical and duplicates, and operate at highest efficiency on straight crude oil from Texas fields.

The crude oil fuels usually used average 20° API., and cost about 3.9 cents per gallon, or $1.65 per barrel, delivered. For some years, the plant has produced about 12 kw. hr. per gallon of fuel, or an approximate fuel cost of 3/10 cents per kw. hr. The plant has used crude oil for the most part, and has had good success with this type of fuel.

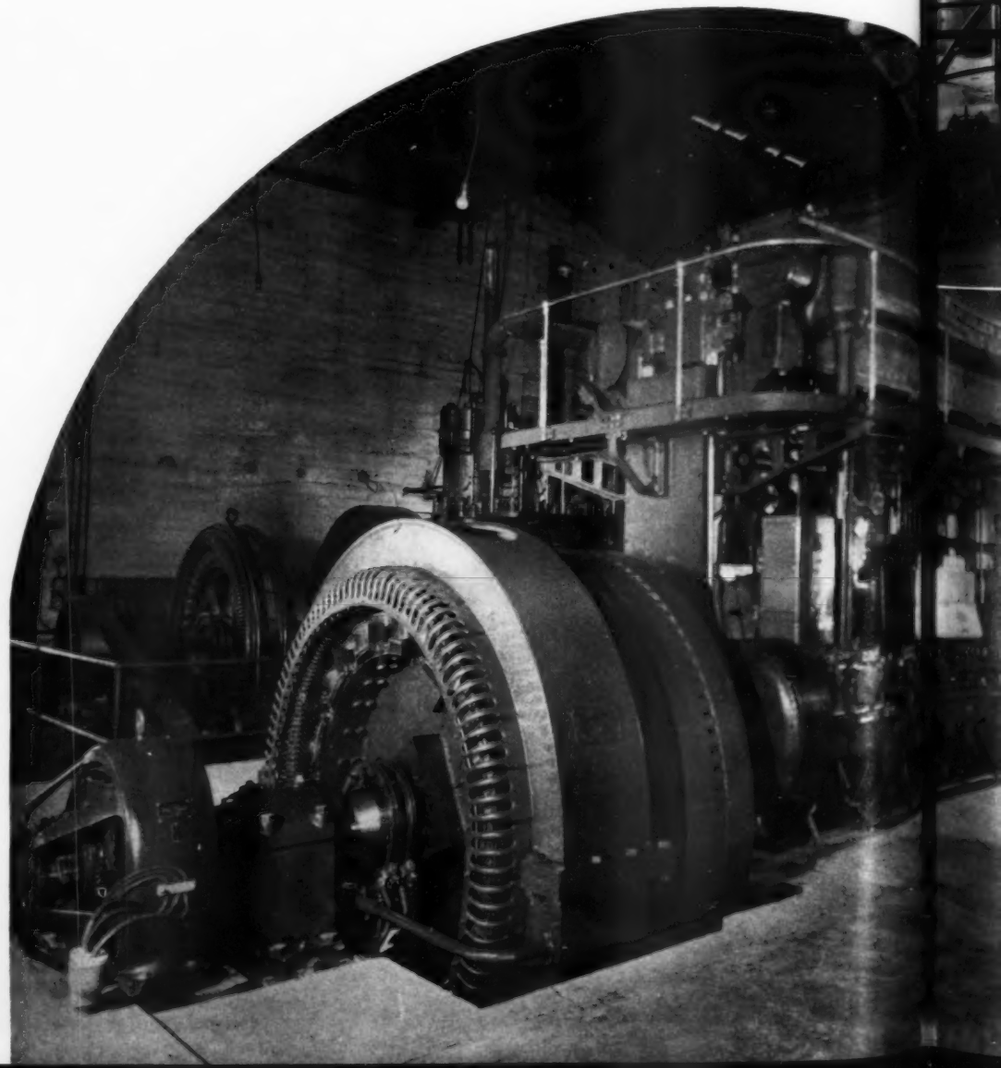
The two new 1000 hp. Busch-Sulzer Diesel engines are equipped with Woodward Governors, Alnor pyrometers, and American Air Filters. The governors are mounted at the generator end and on the operating side of the engines. A distinctive feature is a control panel also mounted on the engines adjacent to the governor, which comprises fuel and all pressure gauges, air and water gauges, etc. Likewise is mounted the Alnor pyrometer instrument. The location of all control and indicating instruments clearly in front of the operator has distinct advantages.

The lubricating oil system, in addition to the regular filters, strainers, and pre-cleaning filters, also includes as a further precaution, a regular Skinner lubricating oil reclaimer through which all the lubricating oil is periodically reclaimed. The engine's lubricating oil accessories also include an Andale oil cooler.

The electric equipment consisting of a 700 kw. General Electric generator with direct connected exciters is standard in this plant. The switchboard and switchgear, as well as the instruments, are General Electric, the present board being all modern, with deadfront control equipment, voltage regulators and scynoscope.

The power plant building is constructed in sections and has been extended from time to time to house the new units. Consequently ample space has been provided each time a new unit was installed, and the entire plant presents an unusual convenient appearance for a plant that has grown up over a period of decades. The building is of brick and reinforced concrete construction, properly ventilated and lighted.

The engine cooling water is taken directly from



the reservoir of the water works system, and being quite suitable for engine cooling, no closed cooling system is used. Schubert-Christy cooling towers of ample capacity provide cooling by the open atmospheric evaporation principle, and duplicate circulating centrifugal pumps direct connected to General Electric motors furnish the water circulation. Bryan has recently reconstructed its water works system, which includes a large modern concrete reservoir located adjacent to the power plant building. A considerable amount of new pumping equipment was installed, and the system generally revamped along the most modern lines, with the result that a much better efficiency and economy have been realized. Many improvements have been made in and around the power house, extra space provided, together with the addition of several new improvements in the transmission and distribution system to take care of the considerable R.E.A. load taken on by the plant.

A continuous and unbroken record of the plant's performance and economy has been kept over a period of years by Mr. Charles Ramsey, Chief Engineer, and reported to the ASME power cost committee. This is a very enviable record and is among the best for general overall economy, power factor and plant factor. The record places the Bryan plant near top ranking for well sustained operating economy and efficiency.

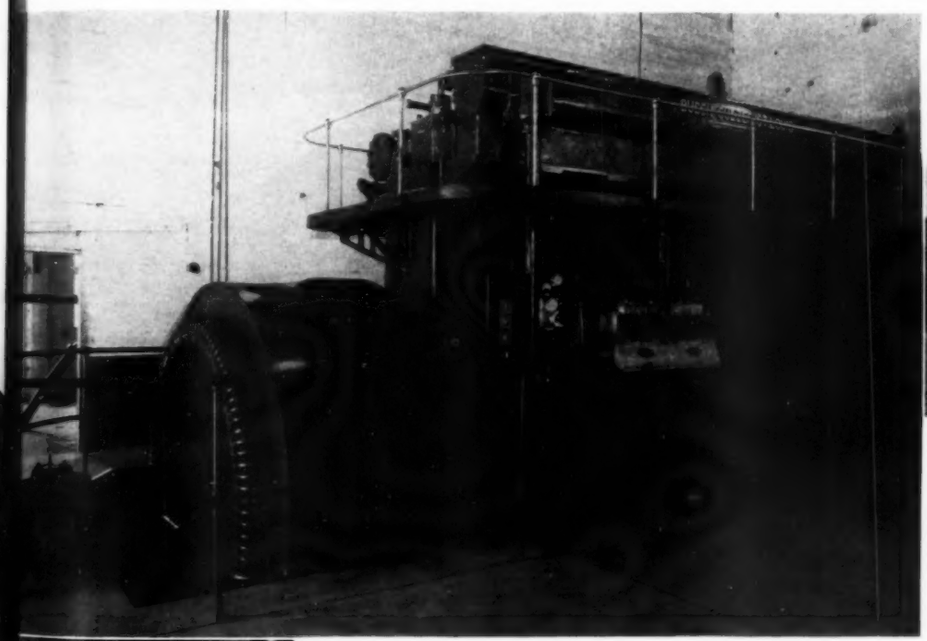
Much of the rural area around Bryan is taking on the R.E.A. service, and the amount of current per meter is rapidly increasing. The result is that load is mounting rapidly, as the REA service expands through the community. It is quite possible that additional generating capacity may become necessary in the near future and require the installation of additional units or larger capacity engines. The ability of the Diesel engines to stay on the line, and furnish a reliable supply of power throughout the area has been amply demonstrated.

Not all the demand increase for recent years is ascribed to the growth of the city. The increased use of current per customer has likewise been rapid, due in considerable measure to additional use of current for refrigeration and air conditioning, extra park and street lighting, as well as more general use for current in public buildings, schools, etc.

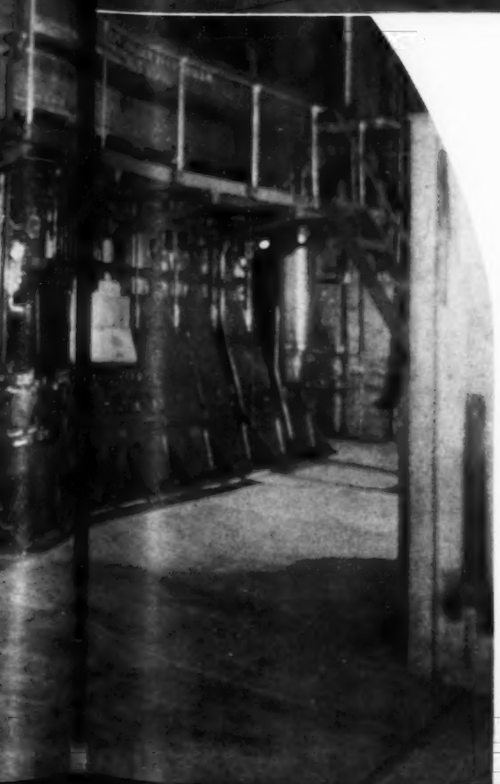
Comparable with many other similar communities in this region, the Bryan area uses nearly twice as much electricity per capita as it did ten years ago. While the majority of the communities in Texas, having their own municipal electric plants powered by Diesel engines, have witnessed a similar growth and increased demand, it may be pointed out that the expected increase in the load, and hence the installed capacity will double itself in the coming decade, a fact that hardly seemed possible four years ago, when much of the present capacity was planned for. There is no longer any consideration given to any other prime mover for these medium sized towns where the Diesel engine adapts itself as to size, capacity, and dependability.

It is also observed that the increased revenue available in towns that operate their own plants has led to the employment in the majority of cases of competent engineers as well as city managers.

Bryan, as well as many other communities in south central Texas, has experienced this natural and logical growth to a greater degree than in other sections of the state, and has been less hampered in its efforts. As would be expected, these plants furnish a good yardstick for measuring the possibilities of the Diesel for generating electrical energy.



The two views left are the two Busch-Sulzer, 1000 hp. Diesels installed at Bryan, Texas, between 1937 and 1939. Above, exterior of the Bryan municipal power plant.



View of the pumping plant taken from top of levee showing fuel oil storage tank right, drainage canal lower right, pump discharge piping crossing over the levee.

KEACH DRAINAGE AND LEVEE DISTRICT

By R. D. CAMPBELL

DRAINAGE and irrigation projects have long been popular fields of service for the Diesel engine. There are certain conditions or requisites in each of these services which are readily and thoroughly satisfied by the Diesel engine, thus accounting for its wide acceptance in these applications. The sustained economy from half load to full load, the ability to start and stop quickly, its flexibility in speed, and its consistent dependability make it an ideal form of power for both drainage and irrigation service.

In years past, it was the heavy-duty, slow speed Diesel which was selected for the economical handling of large quantities of water. Since the advent of the medium speed Diesel engine, however, this smaller and faster type of engine has found favor in such applications. The medium speed Diesel is strictly a heavy-duty engine, having cylinders of approximately 7″ to 12″ bore by 10″ to 13″ stroke, operating at speeds of 500 to 1,000 rpm. and having a fuel economy almost equal to the largest size Diesel engines. The weight of the engine and the foundation size, floor space, and head room requirements are considerably less than for the slow speed Diesels.

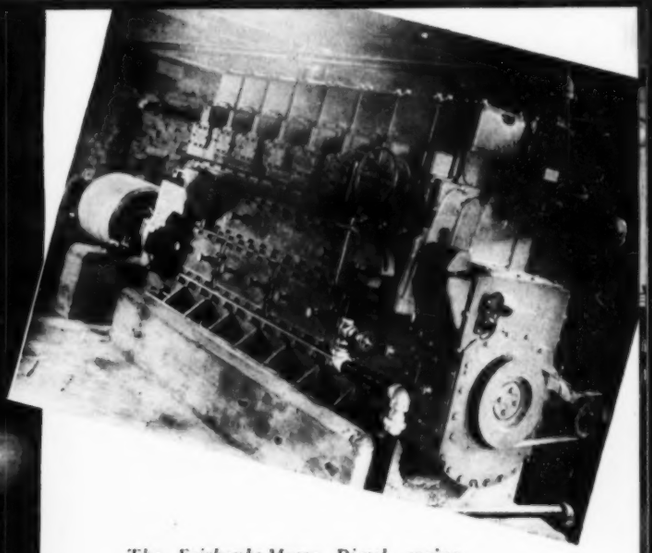
The Keach Drainage and Levee District was organized many years ago for the purpose of protecting valuable farm land along the Illinois River from the ravages of floods and high water. A levee system was constructed along the bank of the river and a pumping plant was installed at the lowest point of the protected area. The pumping equipment is used to lift the run-off water over the levee and discharge it into the river. Without a method of disposing of the surplus rainfall or run-off water accumulating behind the levees, the land would remain inundated and almost as useless as if there were no levees.

The original pumping plant equipment consisted of two large boilers and two slow speed centrifugal pumps driven by steam engines. The equipment was large and could not be placed in operation on short notice. As the steam equipment became obsolete and worn, it was decided to replace it with more modern machinery. During the last three years Illinois has again became a leading oil producing state, now ranking third among all of the states. The availability of ample quantities of cheap fuel and the rapid development of the Diesel engine made it the logical type of power to replace the old steam equipment.

The new equipment, which was installed this past spring, consists of an 8-cylinder, 8″ x 10½″ Fairbanks-Morse four-cycle Diesel engine rated 300 hp. at 720 rpm. The engine drives a 42″ Fairbanks-Morse screw type pump delivering 46,000 gallons per minute against a total head of 13 ft. when operating 535 rpm. The engine is equipped with an extended shaft carried on two Medart Pillow blocks, and drives the pump by means of a V-belt drive. The V-belt drive consists of 16 belts, a 26″ engine sheave, a 34″ pump sheave, and a Medart adjustable belt tightener.

The Fairbanks-Morse Diesel engine is designed for both stationary and marine applications,

General view of the engine, V-belt drive, and main drainage pump. Note Maxim Silencer above the engine.



The Fairbanks-Morse Diesel engine, showing the controls, Alnor pyrometer, and V-belt drive extreme left.

the latter service accounting for many of the engine's features and its general appearance. While this particular model of engine is not a recent addition to the line of Fairbanks-Morse engines, it has been in production some four years and is one of the medium speed Diesels which are finding favor in a variety of applications. As a marine engine, it is arranged for direct-reversing, and is frequently fitted with a reduction gear for slow speed craft. Both the marine and stationary models have a marine type hand control wheel and water-cooled exhaust manifold.

The engine is of the four-stroke cycle type with trunk pistons. The pistons are made of case hardened steel and each piston is fitted with five compression rings and two oil control rings. The heads of the pistons are concave in shape and the space between the pistons and cylinder heads forms the combustion space. No auxiliary combustion space is employed. The engine has a solid injection fuel system, each cylinder being supplied from an individual injection pump located adjacent to the respective cylinders.

The engine is equipped with a pressure lubrication system which supplies the main, crankpin, piston pin, and camshaft bearings, rockers, and rocker arms. A careful study of the engine details will reveal the fact that while this is not a large engine in physical dimensions, it closely resembles the large slow speed engines in many respects. Such details as removable cylinder liners, insert type of bearings, and generous sized inspection plates, attest to the fact that it is designed for long life and heavy duty service.

The engine installation is relatively simple, but complete in all essentials. No air intake filter, other than the guard on the inlet manifold is used, as the engine customarily runs in rainy weather or during periods immediately following rain storms. The exhaust is passed through a 6″ Maxim Type MU-1 Silencer and is then conducted out through the roof of the building. The engine is equipped with an Alnor pyrometer with thermocouples in the exhaust fitting of each cylinder.

As the pumping plant is located several miles from the nearest railroad, the Shell "Dieseline" fuel oil is hauled in by tank truck. The fuel flows from the truck to an unloading pump which delivers it into the 15,000 gallon horizontal storage tank located on the high ground adjacent to the building. The unloading pump unit consists of a Fairbanks-Morse 2″ rotary oil pump V-belted to a 3 hp., 800 rpm., Fairbanks-Morse gasoline engine. The slight elevation of the fuel oil storage tank allows the fuel to flow by gravity to the engine. The fuel is filtered at the engine through a pair of Purolator fuel filters.

The supply of fuel oil is sufficient to keep the engine operating at full load for approximately five weeks. This precaution is occasioned by the fact that in rainy weather the dirt road leading to the plant may be impassable for weeks so far as the fuel truck is concerned. The rainy season is, of course, the time when the engine must operate almost continuously.

An indirect cooling system is used on the engine, with the supply of raw water being taken from the drainage canal. The soft water is circulated by means of a 1¼″ Fairbanks-Morse centrifugal pump which is attached to the control end of the engine and V-belt driven from the camshaft. The soft water passes through a Schutte-Koerting heat exchanger where the heat is lost to the raw water. The raw water is circulated by a 1½″ Fairbanks-Morse centrifugal pump which is V-belt driven from an overhanging sheave on the extension shaft beyond the second outboard bearing. As the water level in the drainage canal is from 12 to 15 feet below the engine room floor level, it is necessary to prime the raw water circulating system. This is accomplished by the use of a common 3″ x 6″ hand-operated thresher pump.

The soft water circuit includes a 50-gallon expansion tank supported on the wall at a point several feet above the level of the engine. The expansion tank is fitted with a gauge-glass to indicate the level of the water in the system. The raw water circuit includes a surge tank or reservoir of 120 gallons capacity, which is mounted on the wall directly above the heat exchanger. Thermometers are located at the inlets and outlets of both water circuits.

The air starting system consists of a 3¾″ x 4″ Fairbanks-Morse single stage water jacketed compressor V-belt driven from a 3 hp. Fairbanks-Morse gasoline engine. The air is stored in two 20″ x 60″ welded steel air tanks manufactured by the Pressed Steel Tank Company. Each tank is fitted with a 300# U. S. Gauge

. . . . *And now please turn to page 48*

The 110′ all steel tug "Dauntless No. 14" on trial run in the East River off lower Manhattan.

DAUNTLESS NUMBER 14

By WILBUR W. YOUNG

FROM Jakobson Shipyard, Inc., Oyster Bay, L. I., early in November came the *Dauntless No. 14*, a new and interesting all Diesel seagoing tug for the well-known Dauntless Towing Company fleet. Trimmed for work, she lies low in the water and presents a sturdy, business-like appearance. Her raked bow and superstructure bespeak the modern note that characterizes every detail of design and construction throughout this powerful tug. Her all-welded steel hull measures 110′ x 25′ x 12.5′. In the roomy machinery space, midships, are the main and auxiliary Diesels with all of the accessory equipment, as well as an air-conditioning plant. The main power plant is an 8 cylinder, 14″ x 23½″, two cycle, Alco Sulzer Diesel rated 1440 hp. at 277 rpm. with reciprocating tandem scavenging pump attached. The flywheel is fully enclosed. A Kingsbury type thrust bearing is incorporated in the engine base. In addition to the scavenging pump, the attached accessories consist of a starting air compressor, dual fresh water circulating pumps, a salt water circulating pump, a rotary lube oil pump, a fuel oil transfer pump and a lube oil cooler. A pair of Manzel force feed lubricators are attached for thorough lubrication of the engine cylinders.

The outstanding feature of the Sulzer design is the scavenging system wherein the scavenging ports are higher in the cylinder liner than the exhaust ports and fitted with gas tight valves which seal the scavenging trunk against the exhaust gases. In this arrangement, scavenging air pressure charges the cylinders after scavenging has been completed and the exhaust ports are closed. The pistons are of the flat top type and are oil cooled which allows for higher ratings than do more complicated piston designs. Cooling oil is introduced under the piston crown through a single pipe, of the telescoping type, with inner and outer casings which eliminate swing joints and other troublesome mechanisms. The cooling water system is arranged to give the circulating water higher velocities around the tops of the liners where heat transfer must be more rapid than in other parts of the system. Cooling water is carried to the heads through outside connections. A Schutte & Koerting heat exchanger is fitted in the engine cooling system.

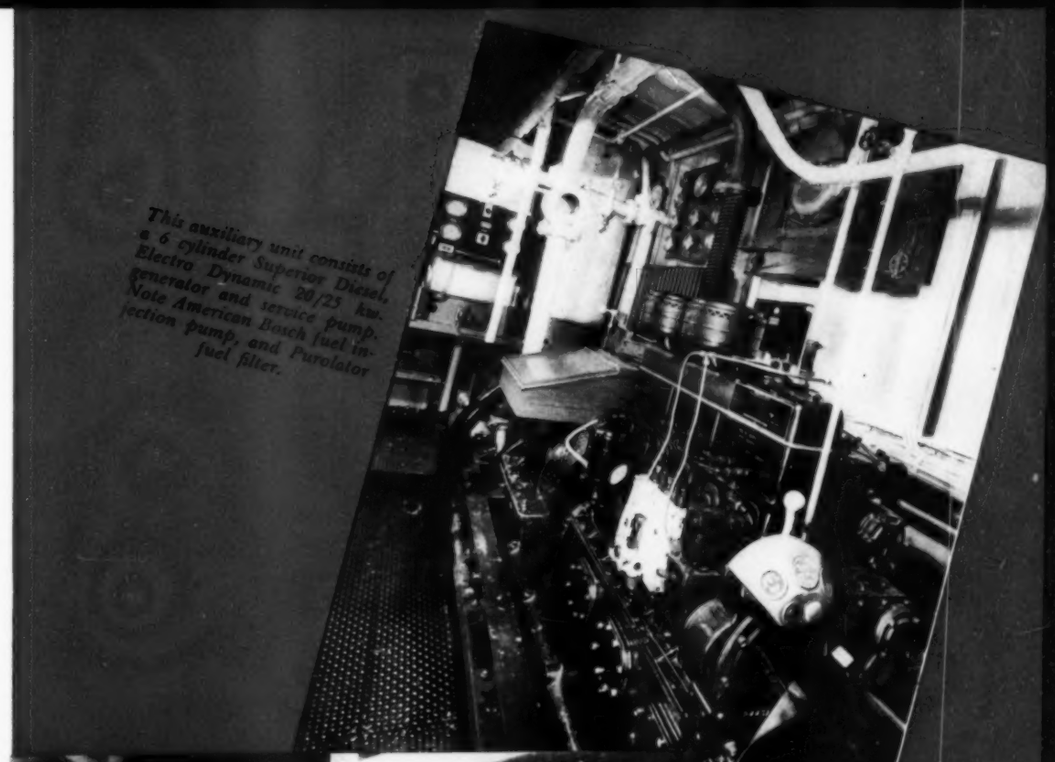
Individual fuel injection pumps are mounted in way of each cylinder. Maneuvering air is admitted to four or eight cylinders at the operator's choice, depending on operating condi-

tions. This big engine idles smoothly at the low speed of 40 to 50 rpm. and it responds alertly in maneuvering. A Pickering mechanical governor is fitted for over speed control. A Sentinel filter is installed in the fuel oil system and a Hydroil reclaims the lube oil. A Reliance tachometer gives the operator accurate engine revolution readings at his post. An unusual arrangement in the form of a Y connection leading from the exhaust manifold results in appreciable reduction of back-pressure. A large Burgess exhaust Snubber is mounted above the engine and extends well into the stack. The intake silencer is of the engine company's manufacture and is arranged to take air either through the stack or from the engine room.

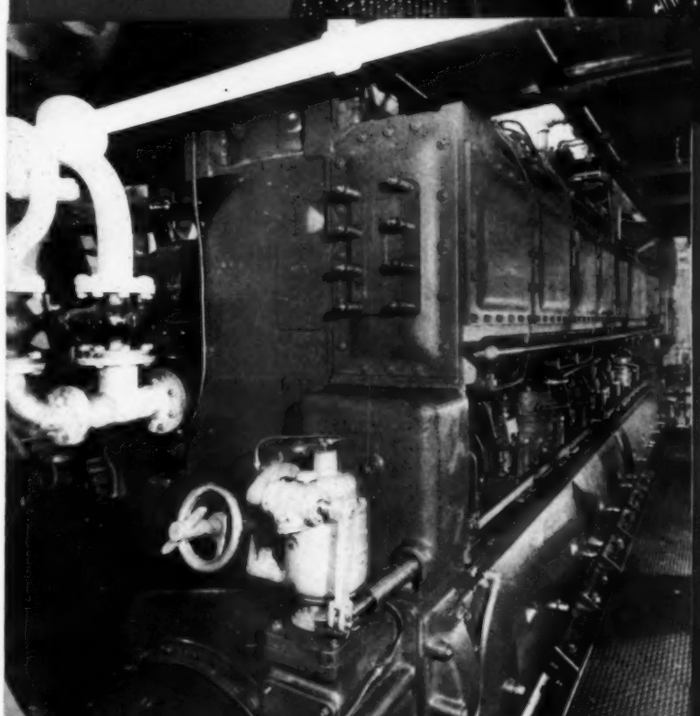
The ship's electrical requirements are supplied by an Electro-Dynamic, reversible shaft, 20/25 kw. generator which is V-belted to the propeller shaft with an Edison battery floating on the line. The switchboard is a Smith-Meeker unit which is fitted with Weston instruments. The auxiliary unit consists of a 6 cylinder Superior Diesel driving an Electro-Dynamic 20/25 kw. generator and a general service pump. This auxiliary Diesel is fitted with American-Bosch fuel injection pumps, Purolator fuel filters, and Leece-Neville electric generator and starting motor. The electric steering gear and towing machine are of American Engineering Company make. All of this machinery is so well arranged in the machinery space that ample room remains for the free movement of the operators.

The *Dauntless No. 14* is obviously fitted for wide range operations, carrying as she does extra large fuel, water and food storage facilities, as well as quarters for nineteen, including officers and crew, a comparatively large complement. The quarters are air conditioned by Carrier equipment. Two showers and laundry facilities are provided for the crew. An "electric" refrigerator, large enough to preserve many days' rations is installed in the galley.

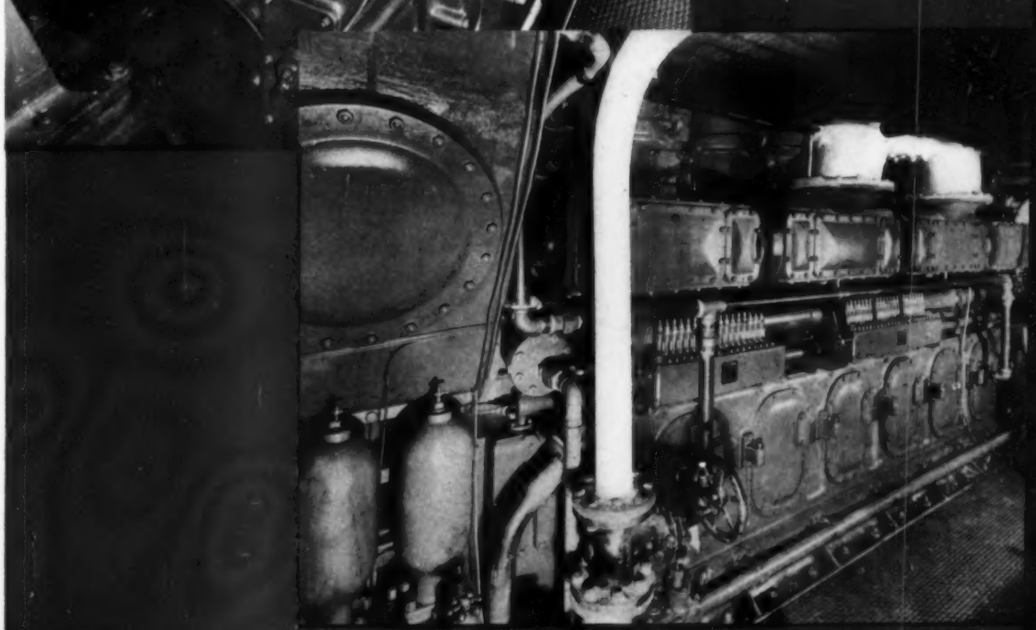
At the conclusion of successful trials, the *Dauntless No. 14* was given over for a day of cruising with her owners and guests after which she was immediately put into service. She ran up 14 knots running free and with a tow she does an easy 10 mph. Here is a tug that is bound to pay handsomely on the investment in her and to set a high mark of towing efficiency. Keen design, typical Dauntless management plus Diesel economy and dependability will combine to make the *Dauntless No. 14* an outstanding craft through many years to come.

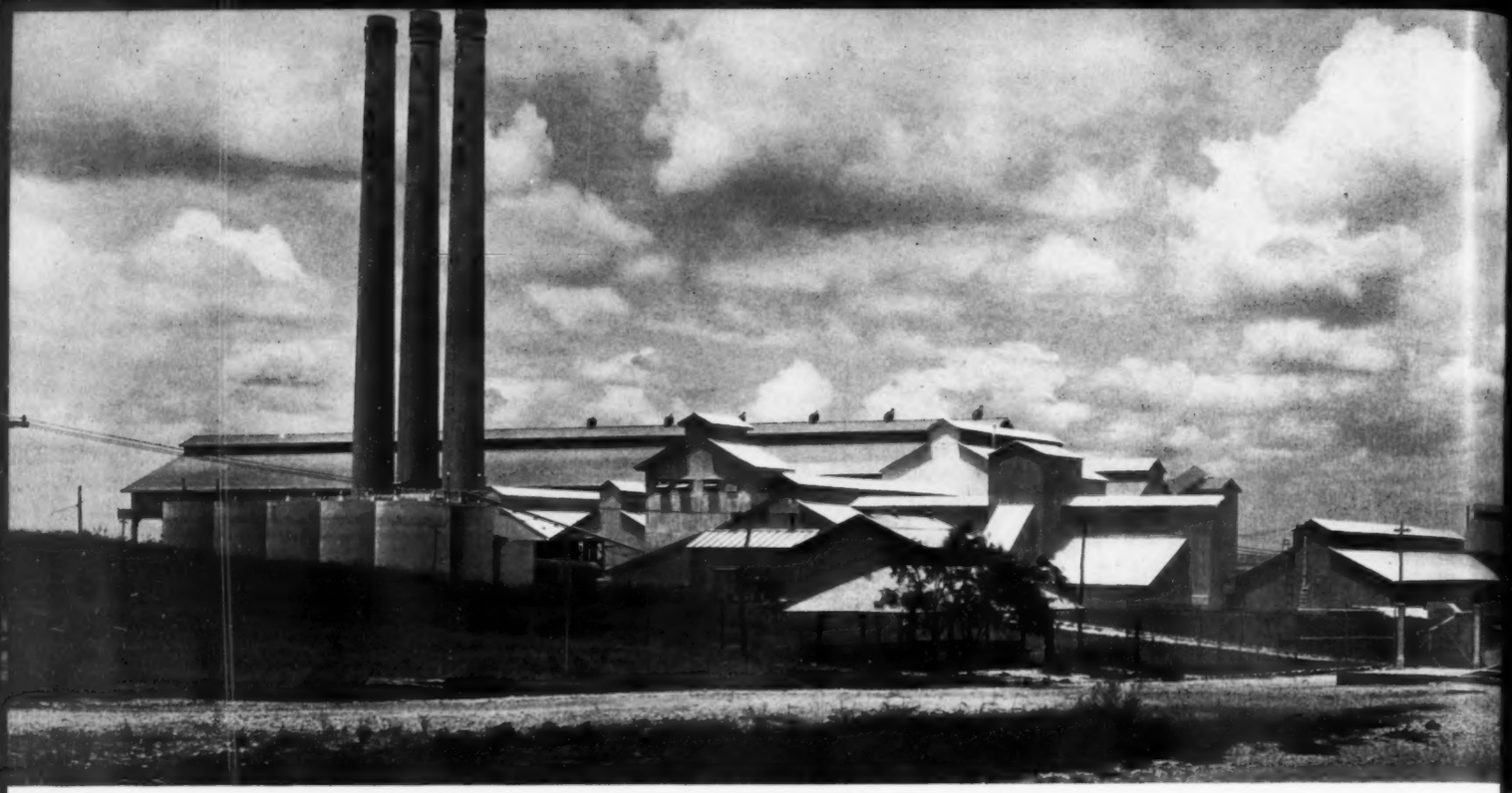


This auxiliary unit consists of a 6 cylinder Superior Diesel, Electro Dynamic 20/25 kw. generator and service pump. Note American Bosch fuel injection pump, and Purolator fuel filter.



Left and below, port and starboard sides, respectively, of the main power plant, an Alco-Sulzer 2 cycle Diesel rated 1140 hp. at 277 rpm. Note Pickering governor left, and Manzel force feed lubricators below.





General view of the San Antonio, Texas, Portland Cement Plant where Diesels totaling 8200 horsepower are installed.

SAN ANTONIO PORTLAND CEMENT PLANT

By ORVILLE ADAMS

THE second oldest Portland cement plant in the United States, the San Antonio Portland Cement Company, has operated its own power plant for more than thirty years. It was one of the first cement plants to use internal combustion engines, starting with an Allis-Chalmers engine before 1910. Shortly thereafter, it installed two 500 hp. Rathbun-Jones producer gas engines, which were later converted to Diesels. Within a decade, between 1916 and 1926, an additional 3000 horsepower were installed, comprising three large engines. This was followed by the installation of four more engines totalling 5240 horsepower between 1929 and 1939, with some of the old smaller units being dismantled. The total installed horsepower now is 8200. All engines in the plant are the Rathbun-Jones, except one 625 hp. Busch-Sulzer Diesel engine which was placed in operation in 1938.

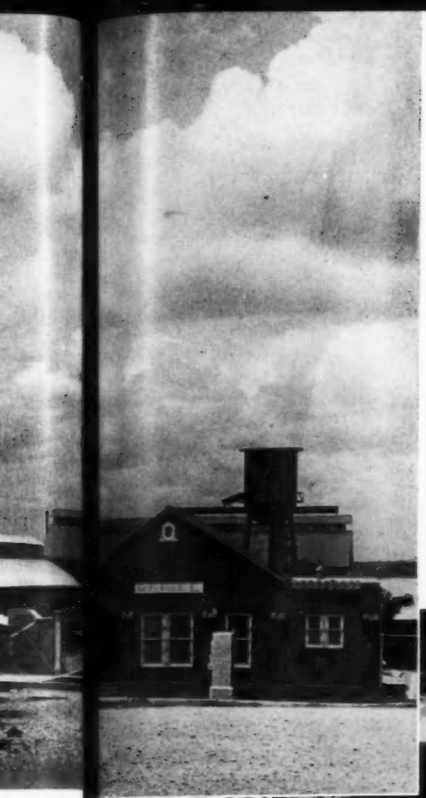
The San Antonio Portland Cement Company's Diesel generating plant is the outstanding industrial application of this type of prime mover in this region. It has made Diesel history no less than industrial history in the Southwest. It is one of the very few plants in this country having always burned crude oil directly from the wells with satisfactory economy and reliability of operation. An abundance of crude oil from local fields found satisfactory as a Diesel fuel has been an obvious advantage in the uninterrupted continuity of the Diesel operation, as the size and capacity of the plant increased with the development of the region throughout the years. With each increased demand for power, the same type and design of engine was installed with the one exception already mentioned.

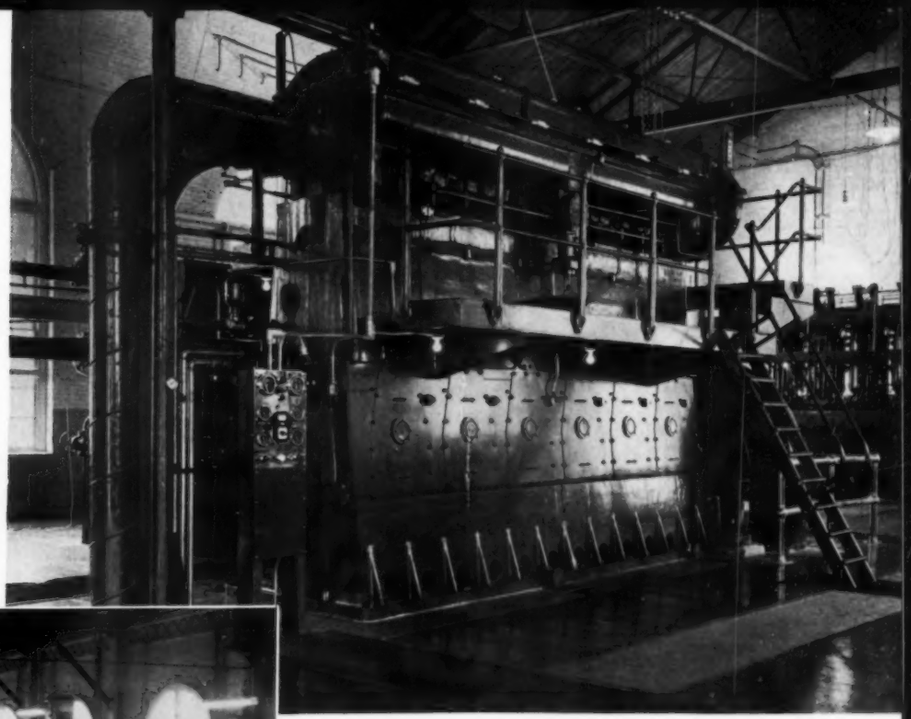
While little basic change in design or fundamental principle of operation has occurred, present day engines are made more efficient by the development and use of certain auxiliary equipment. At the same time, the plant has been kept modern by the incorporation of essential auxiliary equipment. The latest developments in fuel injection equipment, isochronous governors, air filters, silencers, pyrometers, as well as pressure and temperature control and other features of advanced Diesel practice have been added.

The power plant building itself is ample in size, an attractive well lighted and ventilated building, and seems in no way crowded even though it houses seven large engines, a group of auxiliaries, offices and shops as well as locker rooms, storage for supplies, and repair parts. An adequate overhead crane system serves all engines and machinery.

Practically all of the electrical equipment is uniform in type and design, and is General Electric. Generators are separately excited by motor generator sets. The switchboard, switchgear, and switchboard instruments are also General Electric. The board is the modern dead-front type, and comprises every essential instrument and control device for the production and safe distribution of large amounts of current by several prime movers operating in parallel.

Special fuel filters, of the Cuno type, clean the crude fuel for the last three new engines. All fuel used is centrifuged by means of a DeLaval machine before delivery to the day tanks by a Schutte & Koerting transfer pump.





One of the recent Diesel installations. Note Alnor pyrometer on gauge board and Woodward governor, upper right.

General engine room view.

The fuel oil handling system comprises a fuel oil heater to assure easy flow and filtering of the fuel during cool weather.

Special lubricating oil filters, a DeLaval centrifuge and a Schutte & Koerting oil cooler protect the lubricating systems of the various engines. The reclaiming of the lubricating oil removes all contamination and foreign matter, and a most reliable lubrication is obtained. Each engine is equipped with lubricating oil pressure, and temperature alarm control devices of Rathbun-Jones make to assure the maintenance of uninterrupted service.

Vertical risers from the air ducts and exhaust ducts connect to the horizontal air intake and exhaust manifolds and connect the engines to the air filters and exhaust silencers on the outside of the power plant building. Coppus air filters are used. Likewise Maxim silencers are used on the latest engines, which are also equipped with Woodward governors. Many modern devices and gauges are also included and a control unit comprising all of these instruments is provided on the operating side of each engine.

The cooling system comprising a large cooling pond or reservoir and several large atmospheric cooling towers handles all but one of the Diesel engines. The last engine added to this plant, the 1115 hp. engine installed last year, has its own closed cooling system, with its heat exchanger and cooling tower in connection with which a Duro water softener supplies the make-up water. Several conventional type cooling towers of standard design augment the cooling pond, and afford reliable cooling during the long hot months when the heat load is very heavy, and the outside temperature may be around 100° F. for a considerable period. An interconnected pumping system comprising Cameron pumps direct connected to General Electric Motors constitutes the utmost in reliability and flexibility of the cooling water supply to all engines. The water supply from deep wells on the property is very satisfactory for engine cooling.

The chief Engineer, Mr. J. E. Watkins, with many years experience in this plant, is responsible for the production and distribution of ample power supply at all times. He favors the use of several engines of the sizes used, rather than very large units, because this affords ample and sufficient standby and flexibility for overhaul and necessary maintenance work, without the installation of large surplus standby capacity. The advantage of such arrangement when burning crude oil is also obvious; for the same reason, the four cycle engine is favored. The use of similar or identical size engines of the same design, with uniform piston and cylinder sizes as well as other essential parts is likewise favored for this full time, year around 24-hour operation.

This plant continues to expand and add more machinery to produce more products, and the Diesel plant continues to be an outstanding example of conservative and efficient Diesel operation, with new and larger units of the same design being added when needed. Crude oil continues to justify its use as a fuel, since the engines are adapted to use this type of fuel. The operating engineers and crew for general maintenance have grown up with plant itself, and hence the efficiency is outstanding, and the management of the operation is noteworthy in itself. No better example of the feasibility of Diesels for such large industrial plants could be found than that at San Antonio, where there is an abundance of crude oil, natural gas and even purchased power at attractive rates.

Left to right—Capt. Manuel Silva, Skipper of the "Western Pacific"; Hervey Petrich, Vice President, Western Boatbuilding Corp.; Gus Gulart, one of the five co-owners; Leslie Perry, President, Western Pacific Corp.; Martin Petrich, President, Western Boatbuilding Corp.

"WESTERN PACIFIC"

By CHAS. F. A. MANN

ANOTHER "first" from the home of nautical "firsts"! The giant, new, all-electrified tuna clipper *Western Pacific* is the latest and one of the most carefully engineered of the new type tuna clippers, and the first of this type built in the Pacific Northwest.

The new clipper is a product of Western Boatbuilding Corp. of Tacoma, designed in collaboration with Manuel Silva of San Diego, skipper of the new ship; Martin Petrich, veteran Coast builder; and his son Hervey Petrich, the trio constituting the architects, engineers, supervisors of construction, and yard bosses on the $150,000 deluxe type ship that incorporates many refinements of design, the latest all-electric mechanical refrigeration plant, luxurious quarters for the crew, and three Superior Diesel engines for power. *Western Pacific* is the first of the mechanically refrigerated, all-electric tuna ships to be built on Puget Sound, and has attracted widespread interest up and down the Coast as the very last word in developing a tuna ship of extremely simple, rugged design, with the simplest and most foolproof power and refrigeration system possible to include.

Overall dimensions are 100′ x 26′ x 14′ with a gross carrying capacity of about 160 tons of frozen tuna in eight tanks below the main deck level as well as in two large, insulated and refrigerated bait tanks. A new system of handling tuna, outgrowth of those 3-5,000 mile voyages down toward Panama and Central America, has been fined down to the last detail, with sufficient mechanical equipment to do the job and give the ship a 10,000 mile cruising radius with her single 360 hp. Superior main Diesel engine.

The entire ship is arranged to carry some 1,800 scoops of live mackerel bait in cool, circulating seawater bait tanks built of heavy caulked wood and fitted on the after portion of the main deck. Outward bound, in preparation for the long voyage to the best tuna fishing grounds, two of the tuna tanks below the main deck are filled with fuel oil. The remaining center tanks are filled with live mackerel bait in which circulating seawater is passed continuously. These center tanks, plus the two regular bait tanks on deck, are filled with live bait and, with approximately 24,000 gallons of Diesel fuel oil aboard, the *Western Pacific* can continue her complex cycle of fishing and traveling, until, when nearing San Diego on

her homeward voyage perhaps a month later or even two months, all the live bait is gone, the two forward oil storage tanks have been cleaned and filled with frozen tuna, the center and aft main deck tanks all filled with dry-frozen tuna, the upper two live bait tanks on the top of the main deck likewise filled with tuna, kept in cool salt brine. And, with 160 tons of frozen tuna aboard, the *Western Pacific* reaches San Diego with fuel tanks nearly empty and perhaps 50 tons *lighter* than when she began her outbound voyage. But, the 160 tons of tuna will bring $16,000 at a cash clip the minute the ship docks at the cannery! Not bad to split with the ship and a crew of 12 men!

Tuna is caught from low racks slung over the aft part of the deck by hand, dumped into the 10′ x 10′ x 10′ tanks below deck, where first they are brought down to 28 Deg. F. by chilled seawater brine. There are eight of these tanks, two of steel equipped to handle oil. Six inches of wood insulation keep them insulated against tropic heat. In each of the eight tuna tanks is about 800 lineal feet of 1¼ inch iron pipe carrying ammonia liquid from the three compressors. The first brining takes several days to remove body heat and bring down the tuna to about 30 degrees. This washes the fish and removes dirt, scale, and waste. This brine is pumped overboard and a fresh brine, of greater density is poured over them, which has been mixed with seawater and dry rock salt in another tank, and brought down to 10 Deg. F. After a few days, this super-cold brine is pumped overboard and the frozen tuna, now stiff as a girder, is piled like cordwood in the dry-cold, unwatered, refrigerated tanks. This cycle keeps up until the entire load of live bait is gone and the fish holds are full and the trip home has been started.

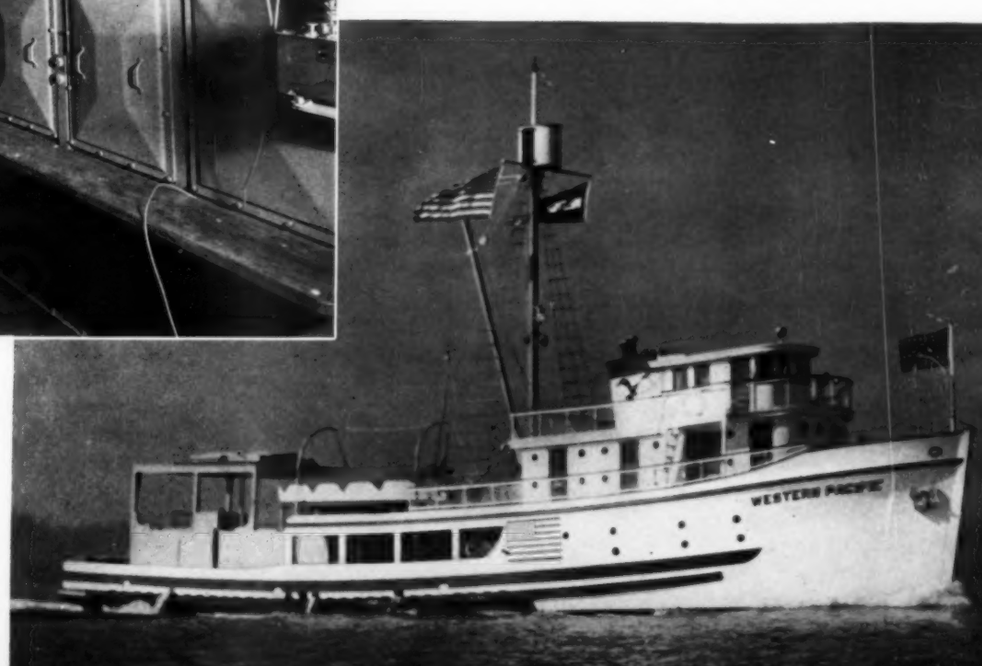
This new technique of cutting Tuna spoilage down to less than 1% means elaborate refrigeration equipment and large proportionate auxiliary power.

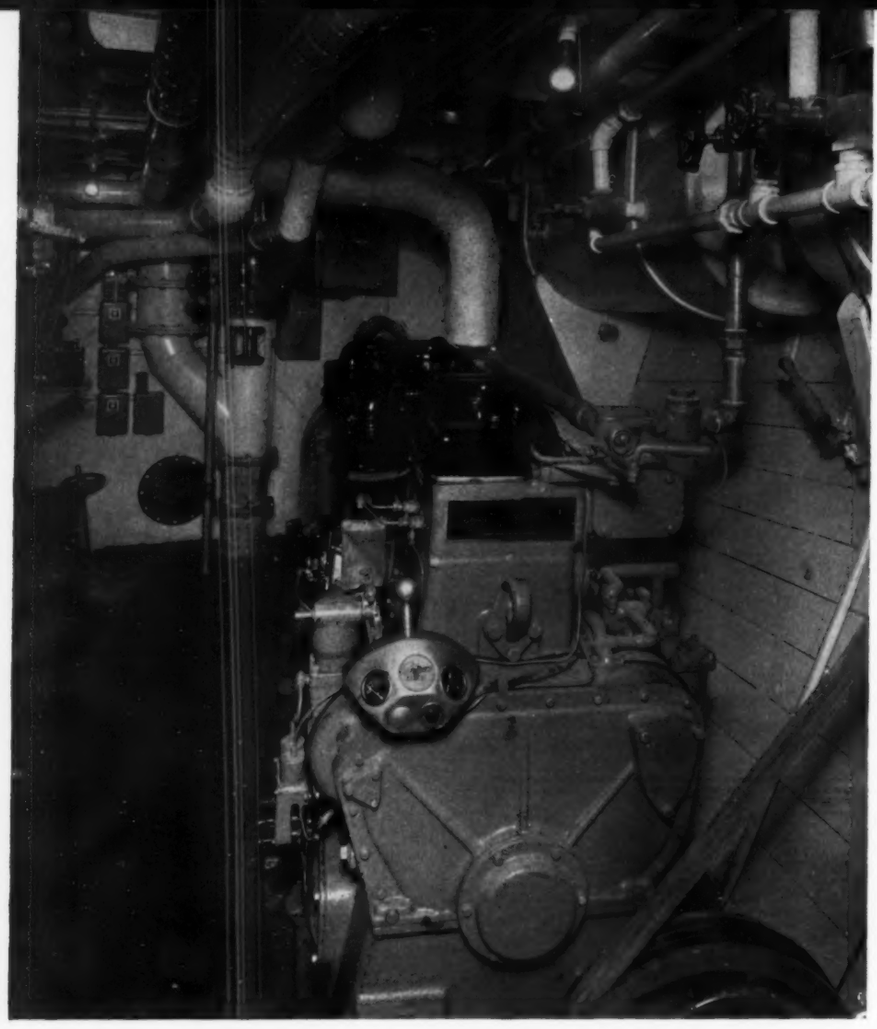
Western Pacific has a 6 cylinder 12½″ x 15″, dual valve, 360 hp., fully-enclosed Superior Diesel main engine, driving a 68 x 49 inch Coolidge Bronze propeller through bronze shafting, at 360 rpm. The auxiliary power, nearly two-thirds the main power, consists of twin Model D-8-L Superior 8 cylinder Diesel engines of 125 hp. each, equipped, like the main engine, with Purolators, American Bosch Fuel injection pumps, Alnor Pyrometers and Reliance Tachometers. Each auxiliary is mounted to the side of the main engine and drives a 75 kw. 240 volt alternating current generator, made by the Electric Machinery Company. The EM Generators are controlled by an EM Synchrostat voltage regulators and synchronizing system to keep voltage in this unique A.C. ship's electric system constant. A 32 volt Willard storage battery system, charged by an automatic Tungar vacuum tube charger, operates emergency lighting and the Leece-Neville electric starters on the auxiliary Diesels.

This is the shrine built into the deck-house of the "Western Pacific" where Portuguese fishermen pray before each day's work begins.

A Square D main switchboard is fitted. The refrigeration system, deck machinery, fans, winches, hoists and all ship motors, twenty-six in all, are operated by alternating current, through Cutler-Hammer control system. Practically all main motors are Fairbanks-Morse, except the novel boom hoist and steering motor. In the engine room proper are two 15 hp. vertical Fairbanks-Morse bait tank water circulating pumps, a Worthington Air Compressor, driven by an F.M. motor, and the engineer's main control stand. All other pumping equipment is located in a novel shaft-pump-pipe alley running over the propeller shaft between the four tuna compartments, located on each side. The two small welded air starting tanks are located near the ceiling of the engine room.

Above is shown the six cylinder, 12½″ x 15″, 360 hp. main Superior Diesel engine as installed on the new tuna clipper, "Western Pacific."





One of the twin 125 hp., eight cylinder Superior auxiliary Diesels. This view shows the starboard engine looking forward with the Fairbanks-Morse 15 hp. bait tank pump on bulkhead in the center.

The refrigeration and pumping layouts are unique, simple and highly flexible. The refrigeration plant, which replaces the old system of huge loads of ice for packing fish, is fitted on a machinery flat directly above the engine room. Here there is arranged a group of three twin-cylinder, 3½ x 3½ inch Baker ice machines, each driven by a ball bearing, 1800 rpm. 240 volt Fairbanks-Morse motor, through a multiple V-belt drive (Gates 7 belt), and a smaller unit to operate ship's stores, likewise a Baker unit with F-M power. The refrigeration pumps are Cutler Hammer controlled. A Walter Kidde Type F Lux CO_2 fire extinguishing system is located or rather centralized here, in addition to an engine room ventilating fan (F-M), and a neat little machine shop, including an Atlas lathe and drillpress, and a Superior chain block engine room hoist. The rudder is of metal sheathed teak to resist corrosion in tropic waters, and shop equipment, for completely building a new rudder or repairing a power launch, is fitted here. Forward of this space is a vegetable and meat chill room; double fuel day tanks, anchor winch, with 7½ hp. Westinghouse gear motor; ship's stores, and chain locker.

Below, aft of the engine room, in the shaft alley, are three 5 hp. and one 3 hp. brine pumps; 5 hp. bilge; a 5 hp. service pump, and a 1½ hp. fuel oil transfer pump and a 5 hp. main engine circulating pump—all Fairbanks-Morse. Two small F-M pressure water systems are fitted, one for sanitary service and one for fresh water. The bilge and service pumps have double valves for common use for any purpose. A 2,200 gallon fresh water tank is fitted aft in the shaft alley, as well as the ammonia gas storage tanks. Her navigation equipment is as complete as many features of her design not heretofore incorporated in a tuna ship.

The crew of twelve live on the Texas, above the machinery deck, in airy, comfortable quarters. They have roomy toilets, lockers and showers and a beautiful Shrine is built into the side of the deckhouse, where the Portuguese fishermen may pray according to their ancient tradition. The radio shack, after the pilot house, carries a fathometer and radio laboratories, two 2-way Wireless-Radio combined, 100 watt phone, and 200 watt radio set. A Photo-Electric pilot and automatic steering gear is carried, as well as full pilot house engine room control. The galley is roomy, equipped with large ice box, oil fired range and roomy table space. All quarters are panelled in Philippine mahogany and trimmed in white. A sun shelter runs all around the ship's main deck, including a novel "chicken coop" atop the bait tanks. She carries an 18 ft. motorboat with 55 hp. Gray engine and a 12′ and an 18′ heavy duty skiff. The hoist carries a boom mounted Pacific Gear Works winch, with a 7¼ hp. G.E. motor, equipped with push-button remote control at the end of a long waterproof rubber cable, so the unloading man can control the hoist from any point atop the deckhouse.

Below are two 4000 gallon fuel tanks amidships; two 8000 gallon fuel tanks forward and two 400 gallon fuel tanks aft. The midship tanks have large metal covers which can be removed, the tank cleaned with soap, and the refrigeration coils turned on for storage of tuna on the homeward voyage.

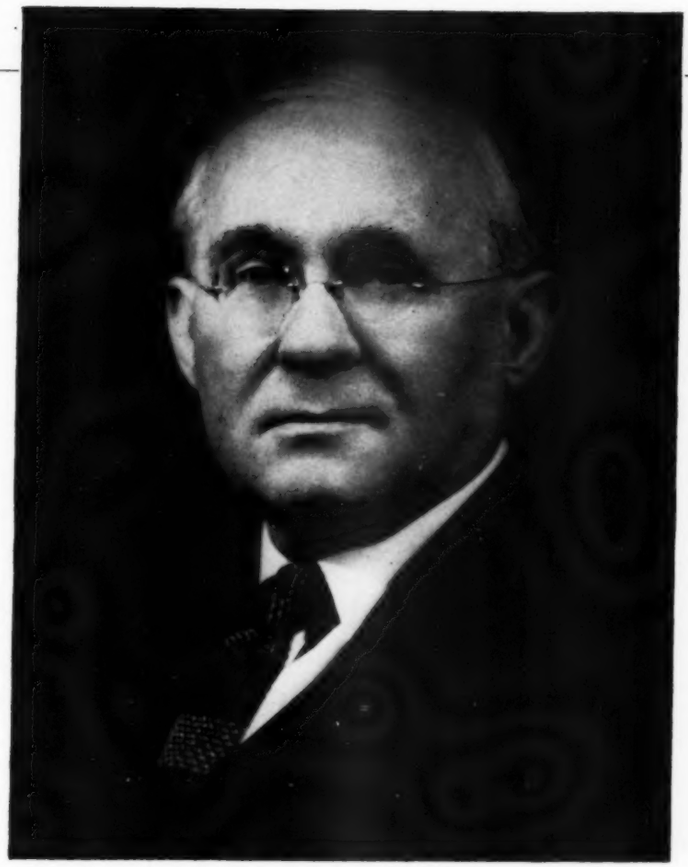
The *Western Pacific*, needless to say, follows the husky, traditional construction methods which have made Western boat building famed all over the Continent. Huge Douglas fir timbers, a clipper bow, a passenger-carrier frontal appearance, and shiny white paint, with a huge American flag painted significantly on each side, make her distinctive in appearance.

Western Pacific has one of the most compact, modern Diesel plants of any ship completed on the Pacific Coast in the past five years. Her entire interior is white enameled and her engineer, Louis Sunde, claims this vessel is the finest he has ever operated.

The ship is owned by the Western Pacific Corporation of San Diego, headed by Leslie Perry and Capt. Manuel Silva. Others in the ownership are Gus Gulart, Dr. Smillie, and Herman Cardoza, all of San Diego.

Supervising all construction and design, was father Martin and son Hervey Petrich of Western Boat Building Co., to whom DIESEL PROGRESS is indebted for this splendid presentation of the Tuna Clipper of 1941, *Western Pacific*.

THE MEN BEHIND THE DIESELS YOU BUY

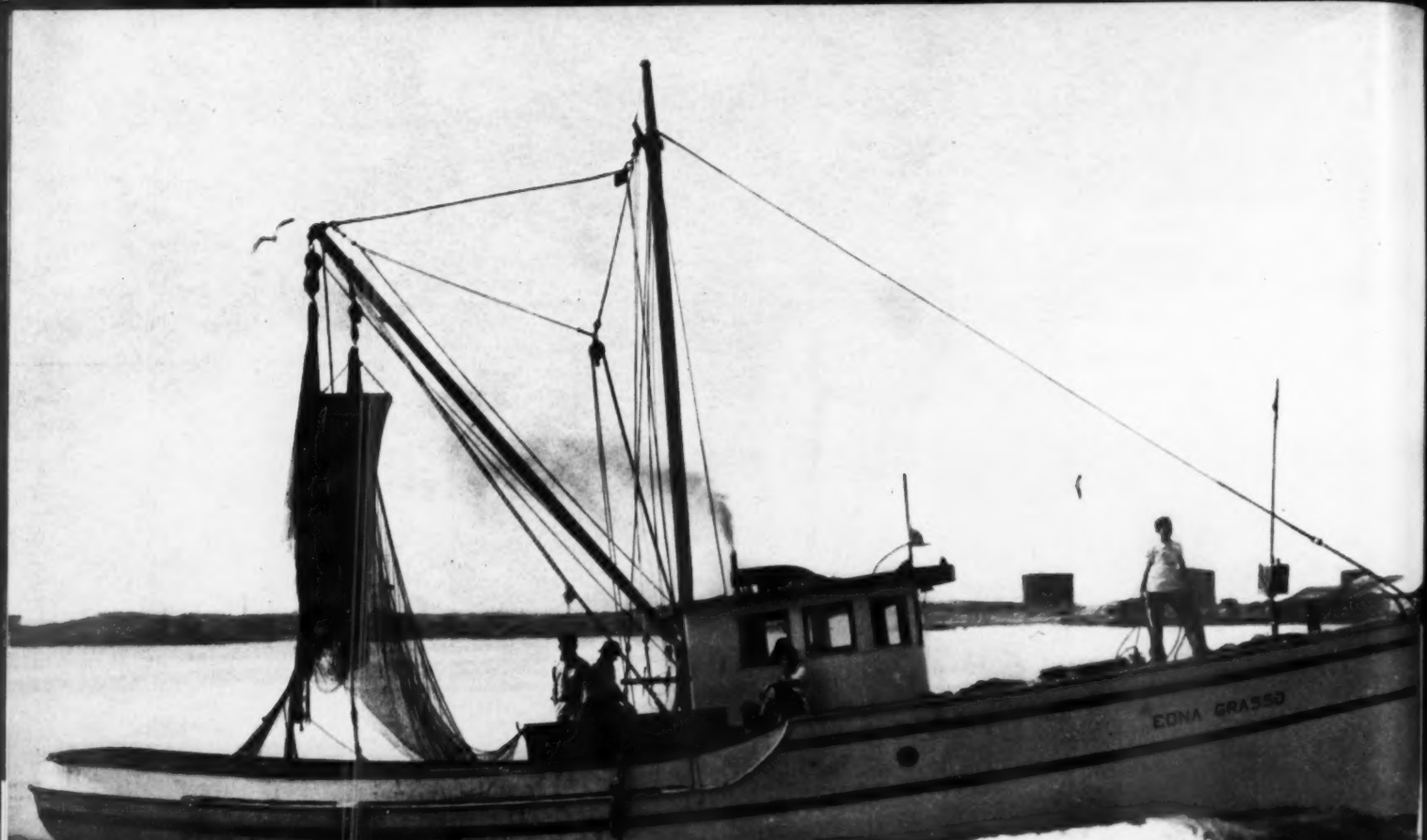


WILLIAM HENRY HARMAN

Vice-President in Charge of Sales, The Baldwin Locomotive Works, which includes the Baldwin De La Vergne Sales Corp. President, Diesel Engine Manufacturers' Association.

★ William H. Harman is a manufacturer of long experience and wide acquaintance and, as a salesman, has a record of achievement of which anyone might be proud. He was born in Camden, New Jersey, in 1879. After education in the Camden grade and high schools, he went to the Camden Iron Works where he started running a wharf crane, loading iron pipe, and ended up twenty-one years later as a salesman selling hydraulic machinery all over the United States and anywhere else where there seemed to be a chance for an order. In 1915, Mr. Harman went to the Southwark Foundry & Machine Co. in a selling capacity. Four years later, in 1919, he became President of Southwark, which today is the Baldwin Southwark Division of The Baldwin Locomotive Works. When Southwark was absorbed into the Baldwin industrial family in 1929, Mr. Harman stayed right on the job in charge of the Southwark Division. In 1939 he was promoted to his present position of Vice-President of The Baldwin Locomotive Works in charge of all sales, not only of Baldwin, but of the various subsidiaries located at Eddystone. A very important part of his present duties is to supervise the sales of the Baldwin De La Vergne Sales Corporation.

★ In 1938, Mr. Harman was elected President of the Diesel Engine Manufacturers' Association and has been a strong factor in making this Association a "power for good" in the Diesel industry. Mr. Harman is a member of the American Society of Mechanical Engineers and is active in many civic and sport organizations, including a membership on the Olympic Committee. These are the facts pertaining to his life, but they don't picture the man. Mr. Harman can get interested and does get interested in almost anything at the drop of a hat. His curiosity is insatiable, he likes people, talk, sports, his job, and America. He lives with zest and enthusiasm. When you ask Mr. Harman about his hobbies, he is likely to deny that he has any, but further conversation will reveal several very interesting and useful ones. He takes an interest in schoolboy rowing and he has helped foster its growth in Philadelphia and elsewhere. He was active in the formation of the Penn Athletic Club. He is extremely fond of baseball as a spectator and is a stockholder in the Philadelphia National League Baseball Club. Another of his hobbies, the Philadelphia "Town Hall" radio program devoted to the discussion of questions of local interest, is concrete evidence of his civic pride and his desire to advance the best interests of his home city—Philadelphia.



"Edna Grasso" and crew under way in Galveston Bay.

Joe Grasso, Jr., owner of the Joe Grasso & Son fleets, Galveston, Texas.

JOE GRASSO & SON SHRIMP FLEET

By A. V. REITER

CONVINCING evidence of the economy and reliability of marine Diesel operation is the Joe Grasso & Son shrimp fleet of Galveston, Texas, which runs the arc of the Gulf of Mexico northeast to Louisiana and southwest as far as Port O'Connor and Pascavallo, Texas. Seven years ago, Mr. Grasso had no fleet of his own, but bought from independent and individual boat operators. In 1933, in order to insure a more consistent catch and a larger margin of profit, Joe Grasso & Son installed their first Fairbanks-Morse Diesel in the first of their privately-owned fleet. Since then, the firm has progressively added to the shrimp fleet until today the Diesel boats number eleven, each equipped with Fairbanks-Morse machinery.

The eight 60 hp. shrimpers are sister ships bearing the names, *Theresa Grasso, Edna*

"Jenny Grasso" under way in Galveston Bay.

"Johnnie Grasso", one of the 60 hp. sister boats of fleet.

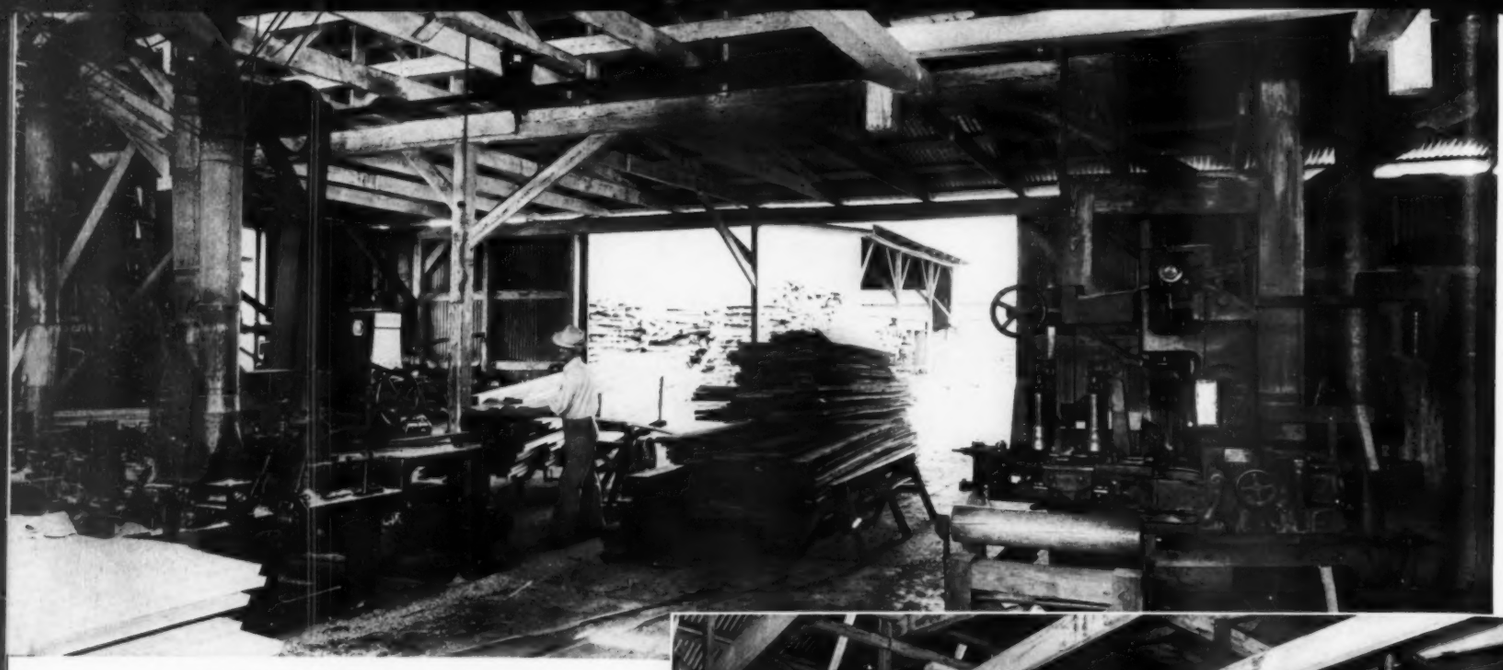
Grasso, Johnnie Grasso, Jenny Grasso, Carmelina Grasso, Joe Grasso, Sr., Joe Grasso, Jr., and *Miss Galveston*. One 45 hp., Model 34, *Oliver,* and two 30 hp., Model 36, *Edwina* and *Cloud,* complete the fleet. The Grasso & Son shrimp fleet has won an enviable reputation in the waters of the gulf because of the trim lines of the vessels, the speed and dependability of their engines which permit the fleet to go to sea in all weather wherever the shrimp are feeding.

Covacevich Bros. of Biloxi, Mississippi, are the builders of the eleven boats. The models are a heritage from the old French and Spanish "luggers" that sailed the Bay of Biscay—light draft types, with a single square sail, designed to navigate speedily and to be suitable for the shallow waters of sounds, bays, and bayous, as well as in heavier seas. Grasso & Son chose the modern adaptation of this style, in preference to the Florida type of deeper draft, because of its speed, its ability to go anywhere, and because of the greater deck room which is needed for handling nets.

The eight sister ships are 48′ long, 14′ beam, with a maximum draft of 4′. The propellors are three blade Columbian bronze, 34″ diameter, 24″ pitch, at 600 rpm. Each vessel is equipped with one Fairbanks-Morse 6 cylinder Diesel rated 60 hp. at 1200, bore and stroke 4¼″ x 6″, Twin Disc reverse and 2 to 1 reduction gear. The hoisting gear is driven from the main engine through a clutch, the operation and adaptation of which is the invention of Mr. Angelo Orsini, port engineer for the firm of Grasso. Mr. Orsini also has designed the silencers which are used throughout. The electric starter is manufactured by Leece Neville, used with a Bendix drive. The generator for charging the starting battery is also made by Leece Neville. Exide batteries are employed for electric starting and lighting. Each engine is equipped with a portable Alnor pyrometer, American Bosch fuel injection pumps, Deluxe lubricating oil filters.

Crew accommodations are for three, forward below deck. The pilot house is located about mid-ships above the engine. The icebox is just aft of the pilot house. Ice is loaded in the home port of Galveston before the fleet makes its run. Cruising speed is ten to eleven miles per hour, and trawling is maintained at the rate of 3½ miles per hour. Two and one-half tons of shrimp per boat is not an unusual cargo for the return to home port.

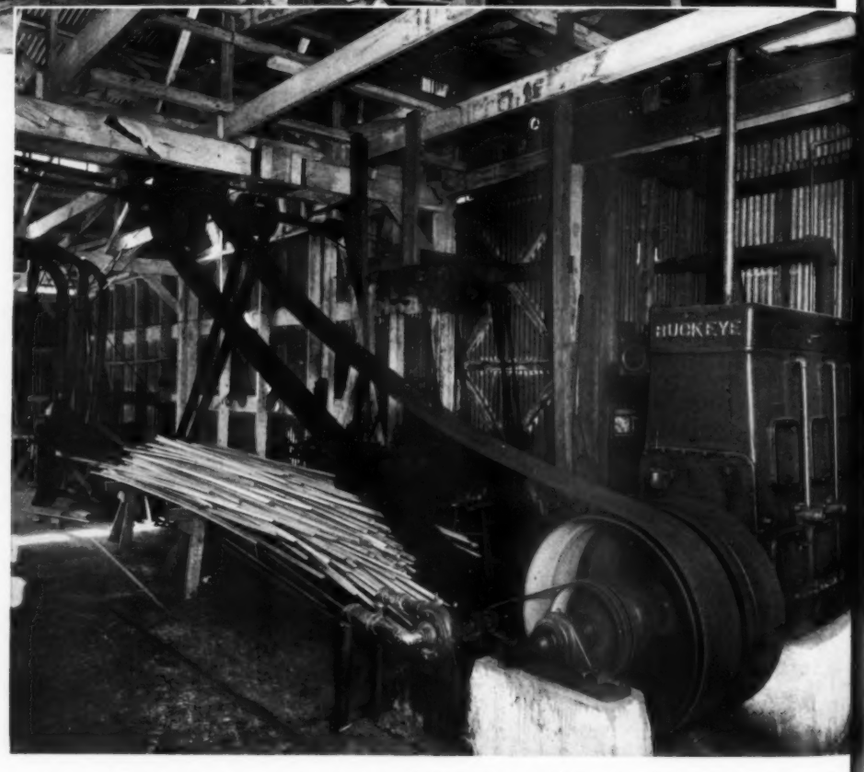
The success of Grasso & Son attests to the dependability, the elimination of the hazard of fire, and the economy of Diesel operation. The firm has found that the Diesel marine engine will operate for much less than the gasoline engine. The average gasoline engine uses approximately one pint of fuel per horsepower hour. The Diesel operates on about one-half pint of Diesel fuel per horsepower hour which is cheaper than gasoline.



Interior view showing the Diesel, at extreme left, and the lumber mill equipment which it drives.

DIESEL IN SMALL PLANT

By WARREN GLEASON



Installed in an open corner of the mill, this Diesel supplies power through a line shaft.

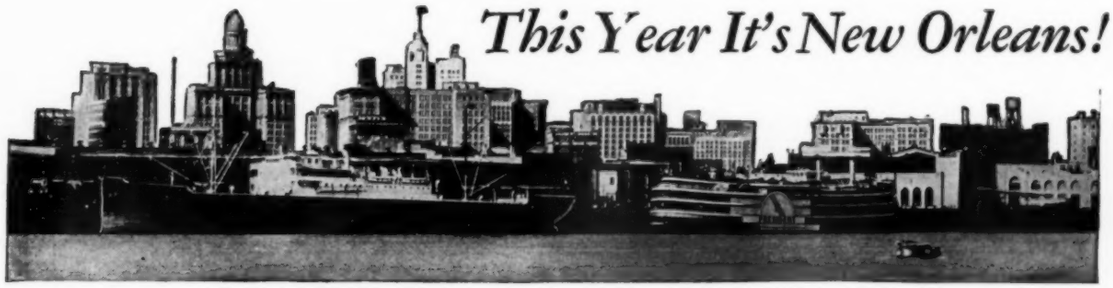
OWNERS and operators of factories and similar plants in the smaller classifications are frequently minded to turn to Diesels because of the unquestioned economies in operation, but are sometimes deterred by the thought of possible extra expense in adding a Diesel engineer to their personnel. To those, the experience of one Diesel owner may be enlightening.

The George Kellett and Sons Company, Inc., of New Orleans, Louisiana, founded forty-eight years ago by Mr. George Kellett, Sr., operates two lumber yards in that city. Their shops are under steady operation nine hours a day, handling sometimes up to 40,000 feet of lumber in one day, with several operations per piece.

According to Mr. George Kellett, Jr., manager of the Press Street plant, electric power was used for many years. A 40 hp. Diesel engine was installed some years ago which gave good service up to two and one-half years ago when heavier demands required a more powerful engine. A Buckeye Diesel of 100 hp. at 514 rpm. was then installed. This Buckeye Diesel is of five cylinders, 7⅛" bore x 10½" stroke. The engine is protected by Buckeye's Silent Watchman. An Alnor exhaust pyrometer is standard equipment and is the layman's and the expert's unfailing guide as to the performance of each cylinder. Fuel supply equipment is of American Bosch manufacture.

As for the engineer of this installation, Mr. Kellett says "Anybody in the plant." The shop foreman, his colored assistant, or others of the shop crew can handle the engine. All they have to do is to start it and stop it. Not one cent has been spent for repairs on this Buckeye Diesel and its operation is still faultless.

Prospective plant operators without technical training can appreciate this type of information. Results like Mr. Kellett's are what they should expect from today's Diesels.



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American Merchant Marine Conference

HOTEL ROOSEVELT
NEW ORLEANS

December 8, 9, 10 and 11, 1940

AGAIN the Propeller Club of the United States sponsors the American Merchant Marine Conference, this year in conjunction with its Fourteenth Annual Convention at New Orleans—one of the nation's greatest ports and a center of deep-sea and inland waterway activities.

Recognized authorities will address the Conference on subjects of timely interest and importance to the entire American Marine Industry, the purpose being to provide an open forum for the discussion of problems confronting the industry, to promote the spirit of cooperation, advance the American Merchant Marine in all its branches, and further develop public interest in American water transportation.

Conference sessions on Tuesday, December 10th, both morning and afternoon, and, in the evening the Annual American Merchant Marine Conference Banquet . . . Propeller Club sessions on Monday, December 9th and Wednesday, December 11th . . . Entertainment features—sightseeing, golf tournament, plenty of time to visit beautiful New Orleans and its historic sights.

The need for constructive and coordinated effort was never so necessary as at present . . . Your help and participation are needed in this program for furthering the best interests of the American Merchant Marine for our economic and military defense . . . Arrange now to attend the Conference and Convention, and to take part in this most important annual gathering of the American Marine Industry.

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J. LEWIS LUCKENBACH, Chairman
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Fourteenth Annual Convention
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HARBOUR TOWING — SCOWS
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The Shaler Co. Ltd.
Toronto, Canada

July 16, 1940

Gentlemen:

Having used your Shaler Rislone for the last three years, we thought you would like a report on its performance.

We have one Vivian Diesel engine of fifty-two H.P., one Vivian Diesel of 160 H.P., both 4 cycle engines, also one Fairbanks Diesel 38 H.P., one Fairbanks Diesel 45 H.P., one Fairbanks 46 H.P. semi-Diesel, one 100 H.P., Fairbanks semi-Diesel.

We can not give a comparison with the Vivians without Rislone, as we have used it from the time when engines were new. However, in comparism with other engines of the same make, the results are very marked. We have never had a stuck valve or a stuck ring in the 4 cycle engines. After 2500 hrs. of full power operation, we had the pistons out of the 160 H.P. Vivian and found all the rings free and the pistons not even dirty. We have never had to tighten a bearing in either engine through wear.

In the 2 cycle engines, we have had a much better comparison. As our engines are in tugs they are very often overloaded and this caused the exhaust ports to plug with carbon. We tried putting Rislone in our oil without cleaning the exhaust ports. In six weeks time we examined them and found the carbon had all disappeared. We now never touch our exhaust ports.

We also had trouble getting oil to the exhaust side of the pistons. Whereas before using Rislone they were dry, now they are well oiled. We have had no bearing trouble whatever with these engine bearings. I remain

Yours very truly,

C. H. Cates & Sons Ltd.
per Charles H. Cates.

C. H. Cates & Sons Ltd., one of the outstanding companies engaged in the towing business in Northwest Vancouver states that RISLONE has cured their problem of stuck rings and valves in their Diesel engines. Read their letter reproduced above.

Rislone, a combination of little known chemicals acts as a solvent to dissolve all types of gums that form in ring grooves and on valve stems. RISLONE'S high capillary attraction assures adequate lubrication to all moving parts, facilitates easy starting and by dissolving the gums which come from all oils and Diesel fuels, permits longer runs before overhauls. RISLONE lowers maintenance costs,—use it with your regular lubricating oil. . . Where special Diesel oils are used, RISLONE will further reduce gum and carbon formations. If you are having ring or valve trouble — let RISLONE rid your engines of these problems. THE SHALER CO., Waupun, Wis.

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KEACH DRAINAGE

. . . . *Continued from page 35* . . . .

Company pressure gauge, and Ashcraft safety pop valves.

It is of interest to note that no provision is made for duplicate auxiliaries, such as cooling water pumps, air compressor, etc. This is not an omission, but is typical of this type of installation. A delay in starting the main pump or an interruption in the operation would not be cause for concern unless such delay or interruption was for a period of several hours. The service requirements of this type of plant are in contrast to those of a municipal light or water plant where interruptions of very brief duration will not be tolerated. This point is mentioned to call attention to the fact that any plant should be arranged, designed, and equipped to best meet the particular requirements for which it is intended. As a general rule, irrigation and drainage plants operate only a small fraction of the total time, averaging possibly 1,000 hours per year, and, from the standpoint of economy, must not be burdened with excessive investment and overhead charges. While dependability is quite essential in this type of plant, absolute continuity of service is not required.

The engine has a wet sump which holds all of the lubricating oil required for the system. The lube oil is continually filtered through a pair of DeLuxe Model DF lubricating oil filters which are located on a by-pass line. The filters are of the renewable element type. A Fulton Sylphon Model 530 valve is connected in the lube oil circuit to actuate a signal alarm in case of low oil pressure or high temperature.

One feature which attracts the attention of an engineer upon first entering the plant is the remarkably small size of the Diesel engine and pump which have replaced one of the old steam units. One of the old steam units remains intact in the far end of the engine room, thus affording the visitor a comparison of the relative size of the two types of equipment. One glance into the old boiler room gives mute evidence of the labor involved in operating the old equipment. There is no need for filling the boiler, starting a fire, and firing the furnace for a couple of hours before starting the Diesel engine. Once the big pump is primed, it is only a matter of seconds to start the Diesel and have water flowing over the levee and down the river.

The method of priming drainage pumps is of interest and will bear a brief description for

the benefit of those not familiar with such installations. The engine room floor is usually located several feet above the water level in the drainage canal. The inlet and discharge piping is large in size and as short and straight as possible. The pipe and pump form a siphon or an inverted U connecting the water in the canal with the water on the opposite side of the levee. While the total height which the water is lifted from the pump intake to the top of the levee may be as much as 30 to 40 feet, the siphon effect of the column of water in the discharge pipe after crossing over the levee may reduce the net pumping head to only a few feet. In this particular installation the pump is rated at only 13 feet total head including friction and velocity head, but the total lift to the top of the levee is about 35 feet.

Both ends of the siphon or piping are always submerged in water, and the siphon is primed by means of a vacuum pump located in the engine room and connected to the highest point of the siphon by means of a small pipe, usually 3 or 4 inches in diameter. No valves are used in the main pump piping (the siphon) as valves are expensive and add to the friction losses in the pipe. In placing the main pump in operation, the vacuum pump is started and the vacuum in the pipe fills the siphon with water on both sides. When the siphon is full of water, or nearly full, the main pump is started and the discharge of water begins. It is useless to start the main pump until such time as the siphon is almost filled with water because the main pump has a maximum head capacity of about sixteen feet.

The vacuum or priming pump equipment for this installation consists of a small six-cylinder Fairbanks-Morse gasoline power unit governed at 1,000 rpm. and direct connected to a 3" Nash Hytor vacuum pump. The engine is equipped with a radiator, electric starter, and auxiliaries typical of the small power unit.

The main pump resembles a long radius 45 degree elbow, and is fitted with a screw type propeller rather than an impellor. The friction loss through the pump is thus greatly minimized as the water has an uninterrupted streamline flow. While the pump is arranged for 42" connections, most of the piping is 48 inches in diameter with a reducer fitting on the pump inlet and an increaser fitting on the pump discharge. The submerged ends of the main piping are bell-shaped so as to minimize the entry and discharge losses.

From an engineering standpoint, this type of plant presents many interesting problems re-

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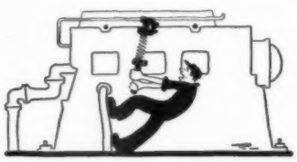
WESTON *Instruments*

quiring a knowledge of drainage, hydraulics, and power plants to effect the best solution. It is of interest that in so many cases the Diesel engine is chosen as the prime mover, and of recent years the medium speed Diesel is receiving such general adoption in this type of service. Incidentally, drainage service is not a problem of any one section of the country, but is found everywhere along the rivers and low lands where land must be protected from floods or drained of excess water.



ENTERPRISE APPOINTMENTS

CAPTAIN C. S. McDOWELL, president and general manager of Enterprise Foundry Company and its Engine and Oil Burner Divisions, announces the appointment of C. M. Sayre as production manager and Hal W. Forsey as controller. In releasing this news, Captain McDowell said, "We feel particularly fortunate in being able to add Mr. Sayre and Mr. Forsey to our executive staff. Our rapidly expanding production facilities and personnel emphasize the need for the best possible executive leadership in our organization. The excellent business background of both these men will be most helpful in meeting the ever increasing needs of Western industry and production."

Sayre was formerly connected with Westinghouse Electric & Manufacturing Co., where he was engaged in production work for over eighteen years. Previous to that time he was with the Splitdorf Electric Co. Forsey comes from Rosenberg Bros. & Co., Oakland, where he was office manager and controller. He has held similar important positions with the Mark Lally Company and the State of California. He has also been associated with such firms as San Joaquin Light and Power Company, Southern California Edison Company, Johns-Manville Company, and the Bankamerica Company.

Commenting on business developments, President McDowell stated that prospects for the future look very bright, as all the Company's lines are benefiting from the increased business tempo, and several of the Company's products are in demand for the National Defense Program.

BURLINGTON ADDS NEW UNITS TO DIESEL FLEET

L. B. JAMES, President and General Manager of Burlington Trailways, subsidiary of the Burlington Railroad, announced today the purchase of the third addition to the Bus Company's fleet of DieseLiners. An order on General Motors calls for the delivery early next year of ten additional buses powered with Diesel engines and completely air-conditioned. This will bring this equipment up to fifty units at a total cost of approximately one million dollars.

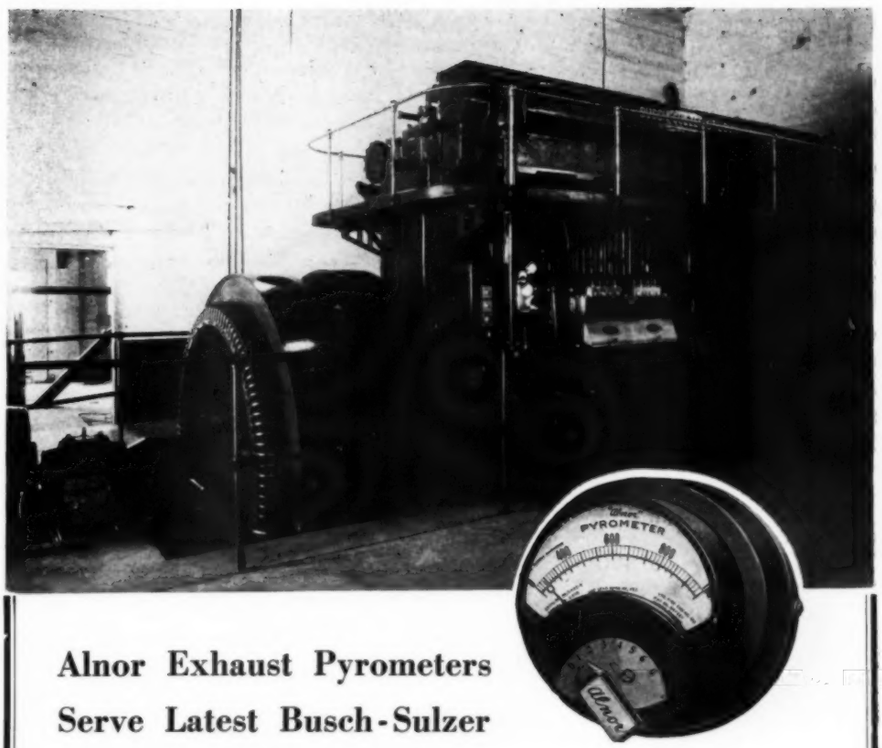
Burlington Trailways pioneered in this new type of highway operation with twenty-five units in June and July, 1939. During the current year, fifteen more modern buses of similar design and specifications were added to the fleet. The order just issued is for a delivery of ten DieseLiners.

According to Wm. Tanzer, Passenger Traffic Manager of Burlington Trailways, the additional new type buses will completely modernize with DieseLiners, the Burlington bus fleet on all through routes between Chicago and Denver, and San Francisco, and Los Angeles and between Omaha and Kansas City and between Denver and Cheyenne.

Continuing, Mr. Tanzer said: "Because of this new type highway carrier, we had in 1939 the biggest year in our history, with gross passenger earnings of $1,721,000. We expect that that figure will exceed $2,250,000 for 1940. In 1939 we carried 136,000 more people than in 1938. During the first nine months of 1940, we transported 118,000 more than for a comparable period in 1939. Our gross passenger receipts for the first nine months in 1940, were $397,000 in excess of the same period for the previous year.

"We have found a greater flexibility in the use of Diesel motors on these transcontinental trips because of the varying altitude. We go from sea level to a maximum elevation of 8,500 feet where our buses cross the Continental Divide through the Cheyenne Pass outside of Laramie, Wyoming. Anybody familiar with the operation of the gasoline engine with spark plugs, realizes the difficulties encountered with that type of motor operation, under such conditions.

"In this power plan we have satisfactorily used the General Motors two-cycle Diesel principle that has proved so effective in the Zephyr trains of our parent, the Burlington Railroad."



Alnor Exhaust Pyrometers Serve Latest Busch-Sulzer Diesels at Bryan, Texas

Bryan, Texas, the home of Texas A.&M. College, has pioneered in the use of Diesels for municipal power plant service in the Southwest. From a small beginning, additional engines have been installed, until today a total of 3720 hp. is in service.

The latest are two 1000 hp. 16¼" x 24½" eight cylinder Busch-Sulzer Diesels. The first of these was installed in 1937; the latter in 1939. Both are equipped and provided with all modern accessories including an "Alnor" Exhaust Pyrometer for each engine. These are located on a control panel mounted directly on the engines as will be seen from the view above.

An "Alnor" Exhaust Pyrometer is the Diesel operator's indispensable aid. It tells him, in a minute, more about the combustion conditions of each cylinder than he could otherwise learn in hours of painstaking care.

An "Alnor" Pyrometer will save its modest cost many times over and the assurance it gives that "all is well" can't be measured in money.

For any size Diesel,
Buy or Specify "Alnor"
Ask for Catalog.

Illinois Testing Laboratories Inc.
Don't Guess Know!
423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS
MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS
PRODUCTS OF 40 YEARS' EXPERIENCE

BARDCO EXTENDS DISTRIBUTION EASTWARD

EXPANSION of the production facilities of the Bardco Manufacturing & Sales Co., builders of automatic emergency standby generating plants, was recently announced by Fred Jervis, president of the firm. For the past five years their activities have been confined to the Pacific Coast, but the growing demand in the mid-west and east for the type of emergency standby electric generating plants built by their firm resulted in the establishment of a large plant at Dayton, Ohio, adjoining the Master Electric Company. Their Los Angeles headquarters will be maintained, but their production and engineering organization will be concentrated at Dayton.

The line of Bardco emergency standby generating plants has been broadened to include full automatic plants with capacities from 1 kw. to 200 kw., as well as a complete line of constant duty generating plants. They will be designated as the Bardco "Master" series. Most popular units have been in the 25 to 50 kw. sizes, but addition of the smaller units to their line permits their entering many new fields of application. Among some of the well-known firms that use Bardco standby plants are such motion picture producers as Warner Bros., Paramount Studios, Walt Disney, Columbia Pictures, and 20th Century Fox. At each of these studios there are installed Bardco plants which automatically take over the load when normal power is interrupted. Only three seconds elapse between power failure and the time that the Bardco plants are carrying the load.

Features of the Bardco standby plants include three-second "on the line" starting, a special voltage regulator developed by Bardco engineers, extreme compactness of the plants, automatic transfer and starting switches, special safety controls and alarms developed expressly for automatic plants. While small automatic plants have been available for a number of years, the Bardco units are the only ones available in sizes capable of handling large electric loads and able to pick up the loads in the amazingly short interval of three seconds.

Descriptive literature on the entire Bardco line of Diesel, gasoline, natural gas, or Butane powered generating plants is available upon request. Address inquiries to Bardco Manufacturing & Sales Co., at 126 Davis Avenue, Dayton, Ohio, or 4031 Goodwin Avenue, Los Angeles.

THE Superintendent of a chemical processing plant saw the stacks belching smoke that turned day into night. It happened before—just recently. He suspected boiler trouble. "Maybe there's one reason for production delays!" He grabbed a phone. "Why the blackouts, Bill?"

"The forced draft blower is acting up," replied the engineer, "the valve in the steam line's gone out again!"

Only a short time ago this valve was repaired. Yet, again, it was causing irregular boiler operation and fuel waste; in fact, it might have crippled the boiler completely! That's how Preventive Maintenance—the modern way of protecting against trouble by stopping it at the source—came into the case.

The engineer wouldn't risk ordinary repair again. And through the Crane Man, R. B. H., he would benefit from Crane's wide experience and knowledge in applying the best corrective measure.

The first step in applying Preventive Maintenance is making sure that valves and fittings are right for working conditions.

Here was a renewable disc valve in the steam line to a turbine-type blower. It couldn't stand the "gaff" of constant throttling. The disc wouldn't last. No wonder the draft blower ran wild!

Preventive Maintenance counseled replacement with a Crane No. 14½P—a plug type disc valve designed for tough throttling jobs. It would give unvarying control of flow—keep the blower running at constant speed.

RESULTS: No more blackouts even after two years. The menace of a shutdown was eliminated with Preventive Maintenance. Another user of piping knows that the Crane Man can help get most for piping maintenance dollars. Because, Crane is not only the source of valves and fittings for every need, but also of accurate information on their proper usage.

This case is based on the personal experience of R. B. H., a Crane Representative in our Minneapolis Branch.

TOUGH FLOW TAMED WITH CRANE BRASS PLUG DISC VALVES

In your boiler room—in any lines requiring severe throttling, you'll find these valves exactly right for the job. They're sound protection against trouble in blower, blow-off, boiler-feed services, in drip and drain lines.

The unusual stamina of these Crane valves is in their plug-type disc and seat construction. Materials are just the right combination for highest resistance to the corrosion and erosion of actual working conditions. The wide seating area repels the damaging effects of wire-drawing and foreign matter; assures long-lasting tightness. The tapered disc provides easy, positive regulation of flow.

With Crane Plug Disc valves, you can apply money-and-trouble-saving Preventive Maintenance to all the *tough* spots in your piping. They're available in a complete range of pressure ratings. For 150 pound services, specify the No. 14½P—in sizes up to 3 inches.

1940 AND 85th YEAR

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

"AIRCRAFT DIESELS"

A LONG-AWAITED book by Paul H. Wilkinson has just been published by Pittman Publishing Corporation. "Aircraft Diesels," as the name implies, is devoted exclusively to the Diesel engine in aviation. It contains much exclusive data and numerous photographs brought back from Europe by the author just before the war. The marvelous accomplishments in Germany and the increasing interest in the United States are described in detail.

This book outlines the basic principles upon which the engine functions, various fuel injection systems, superchargers and accessories for 2 cycle and 4 cycle Diesels. Construction details of different types of engines are given. The development and mass production of Junkers Jumo Diesels are described for the first time.

Flights of Diesel-engined aircraft are described to show that the Diesel is past the experimental stage. Lube and fuel oil specifications are given and the various requirements are explained.

"Aircraft Diesels" will be welcomed by and is of value to students of aeronautics, aeronautical

engineers, engine manufacturers, airplane manufacturers, airline operators, government officials and military officers in charge of aviation and defense, and to air-minded lay people who wish to know more about the next great step in aviation progress.

A word about the author. **Paul Wilkinson** served his engineering apprenticeship with the British - Thompson - Houston Company, Ltd. (English branch of the General Electric Company), served as inspector of British Military Aircraft in the World War, then as inspector of aircraft with the Boeing Aircraft Company and later with the Douglas Aircraft Company. Just before the outbreak of hostilities, Mr. Wilkinson, sponsored by DIESEL PROGRESS, visited the centers of aviation in Germany, England and France. He has been Aviation Editor of DIESEL PROGRESS since 1935 and has written more on the subject of Diesel aviation than anyone in the United States.

The price of Aircraft Diesels is $6.00. Order direct from DIESEL PROGRESS.

C. L. McMULLEN has joined the staff of the Buda Company of Harvey (Chicago suburb) in an executive sales capacity, it was announced recently by R. K. Mangan, Executive Vice-President of the Buda Company. Mr. McMullen came to Chicago from Madison, Wisconsin, where he was Vice-President of the Gisholt Machine Company. Before that, he was associated with the Caterpillar Tractor Company at Peoria, Illinois.

TWIN DISC OPENS ST. LOUIS BRANCH

PROMPTED by increased sales of clutches, drives throughout the St. Louis area—particularly in the Illinois oil fields—the Twin Disc Clutch Company on November 1 opened a new branch office in St. Louis.

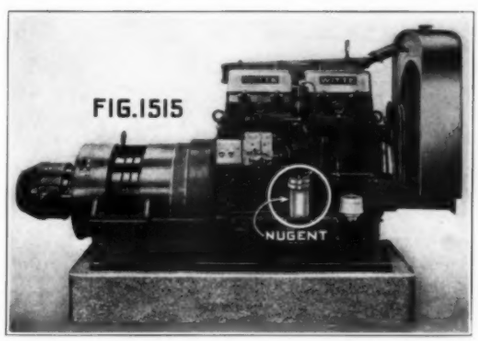
Conveniently situated at 1701 Delmar Boulevard, this office will greatly extend service, parts, and engineering facilities to operators of Twin Disc products in this territory. Henry Wirry, of the Twin Disc factory engineering staff, will be stationed at the new office to handle sales and engineering, thus assuring customers of a competent consulting engineering service on all operating problems.

The new St. Louis staff consists of expert service men who are available at all times to handle any service work required on Twin Disc products, including the new line of hydraulic drives. Complete stocks of all types of replacement parts will be maintained to assure a rapid replacement service. The office also includes a marine gear department to handle sales and service of marine gear units.

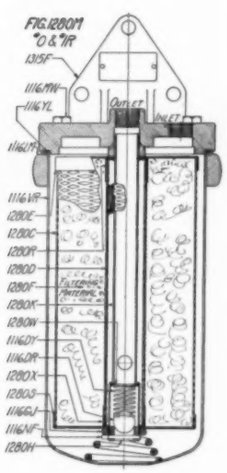
The Twin Disc Clutch Company invites its patrons to make liberal use of the services offered by the St. Louis office, and to visit this new clutch headquarters when in St. Louis.

New WITTE DIESEL-ELECTRIC GENERATING UNIT

PROTECTED BY Nugent!



Right: Nugent Improved Absorbent Depth Type Filter. This model is used on the Witte Engines described here.



Left: Cross-section view of Nugent Filter, showing construction and arrangement of filtering material. This material is inexpensive, and may be discarded when dirty, or washed for re-use.

THE Witte Engine Works, long known as builders of Diesel engines for the small power user from 4 hp. up, has now added a 36-40 hp., 30 kva. Diesel generating unit to round out the upper bracket of its line.

To make sure that all the lubricating oil used in these new Witte engines is kept completely clean at all times, they are equipped with Nugent Absorbent Depth Type Filters, as illustrated at the left. These modern filters have proven their efficiency in removing small particles of dust, dirt, grit, fibrous materials, carbon and discoloration caused by such foreign solids.

Users of Nugent Filters report stopping as much as 75% of ALL OPERATING TROUBLE by equipping engines in accordance with our recommendations. The Nugent line of lube and fuel oil filters is complete. There is a type and size for every purpose. Complete information will be sent on request.

NUGENT TRADE MARK

Wm. W. Nugent & Co., Inc. Mfrs.

Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices
Sight Feed Valves, Flow Indicators, Compression Union Fittings, Oil Pumps, Etc.

415 N. HERMITAGE AVE. Established 1897 CHICAGO, U. S. A.

NUGENT TRADE MARK

DEPENDABLE DIESEL FOR ISOLATED MINE

A MODEL sodium-sulphate and salt cake mine will soon be operating from power furnished by two ultra-modern Bardco Diesel generating plants that are now being given their first tests at the Dale Lake, California properties of the Desert Chemical Company. The location of the mine required generating plants of the utmost dependability and the ability to function in the torrid summer heat of 120 to 130 degrees, as well as during winter seasons when the temperatures drop well below freezing. Bardco Diesel generating plants were selected for this rigorous service, each unit rated at 75 kw.

Superior six cylinder Diesel engines and Master generators were selected by Bardco Manufacturing & Sales Co. of Los Angeles and Dayton, Ohio, for this installation. In addition to the two Diesel plants, there is a 5 kw. Bardco gasoline engine driven generating plant at the Desert Chemical Co. which has been operating during the past summer to supply lights and power for small electric motors during the construction of the mine. There have also been two Bardco power units, belt driven to pumps in operation during the past six months.

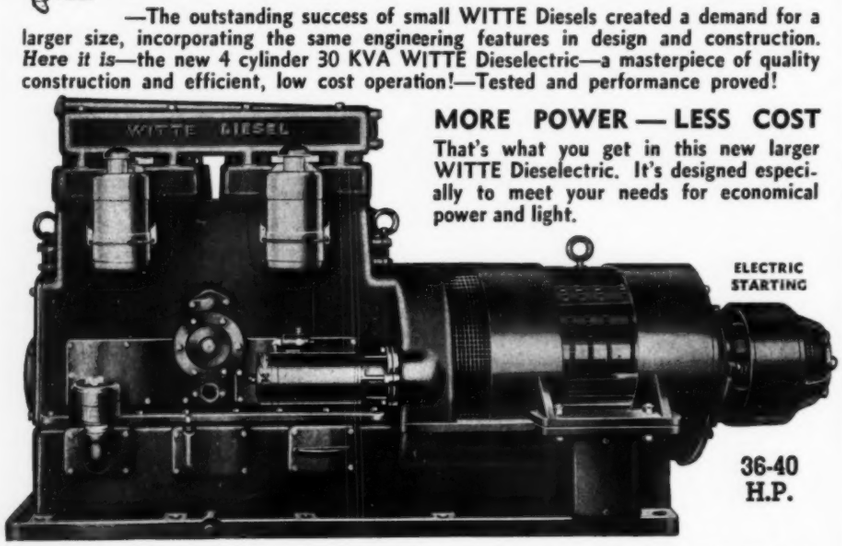
The Bardco Diesel generating plants supplied to the Desert Chemical Co. are equipped with special Bardco automatic voltage regulators which operate without any moving parts, and Bardco safety controls and alarms to protect against overheating, low oil supply, low oil pressure, and other emergency conditions.

Announcing a NEW

30,000 Watt WITTE DIESELECTRIC PLANT

BUILT TO MEET A POPULAR DEMAND!

—The outstanding success of small WITTE Diesels created a demand for a larger size, incorporating the same engineering features in design and construction. *Here it is*—the new 4 cylinder 30 KVA WITTE Dieselectric—a masterpiece of quality construction and efficient, low cost operation!—Tested and performance proved!



MORE POWER — LESS COST

That's what you get in this new larger WITTE Dieselectric. It's designed especially to meet your needs for economical power and light.

36-40 H.P.

POWER AND LIGHT FOR ONLY ONE CENT PER K. W. H.

Here's electricity for the light and power you need — when and where you need it — at the amazingly low cost of only ONE CENT a kilowatt. WITTE Dieselectrics are always ready to serve you.

And you pay for only the current you produce and use. Operate on cheap, non-explosive fuel. Reduce fire hazards. Compact, sturdy, quality built. Easily operated by an average mechanic.

4 to 40 HORSE POWER---2500 to 30000 WATTS

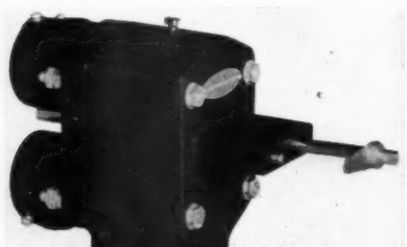
Vertical or Horizontal. 1-2 and 4 cylinders. Manual Control, Electric Starting or Fully Automatic. Investigate all the extra advantages of a WITTE before you buy any Diesel. WRITE now for free illustrated literature giving complete information about this new large WITTE Dieselectric — and smaller sizes. Address request to - - -

2449 OAKLAND AVE.

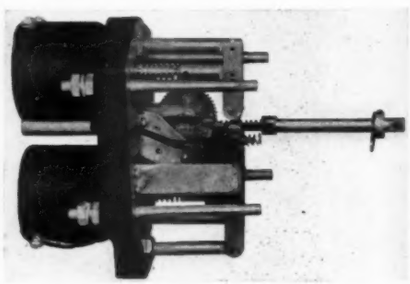
WITTE ENGINE WORKS, Kansas City, Mo.

NEW AUTOMATIC CONTROL SYSTEM

SYNCHRO-START PRODUCTS, INC., Toledo, Ohio, has been developing a series of designs particularly fitting the requirements of the Diesel Industry. They recently announced some new units for the automatic control of Diesel engines applicable for use with their standard automatic control systems.



Model T heavy duty throttle control.

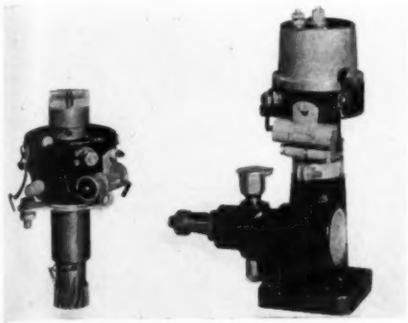


Model T throttle control with cover off.

The requirements in our industry for a control system call for some source of governor supply and our engine manufacturers desire over speed protection in case the throttle governor fails. Synchro-Start have designed and are now producing a combination governor which provides the functions of both requirements.

Another requirement which has been a little hard to meet in the past in automatically controlled Diesels has been the operation of the

throttle for starting and stopping, which in most cases required considerable power and for which an electric motor did not provide sufficiently nor did existing hydraulic governors do quite the job needed. This problem has apparently been solved by Synchro-Start by making a ratchet type motor operated by the conventional Solenoid which provides sufficient power to operate the heaviest throttle and which in case of necessity can also be used for the operation of clutches. Several of these units have been placed in service with quite good results and we understand several engine manufacturers are planning to standardize on this unit. The standard machine now made by Synchro-Start provides a stroke of 2" with a maximum pull of 100 pounds at the rate of a tenth of an inch per second, and operates from the engine's starting battery although very little current is required except for the few seconds of operation. There is an adjustment on the pull rod to limit the stroke to that required for the full operation of the throttle and especially long strokes can be supplied on special order. However, the 2" stroke provided apparently meets most all current demands.



Combination governor for overspeed and Synchro-Start Automatic Controls

DONALDSON APPOINTMENTS

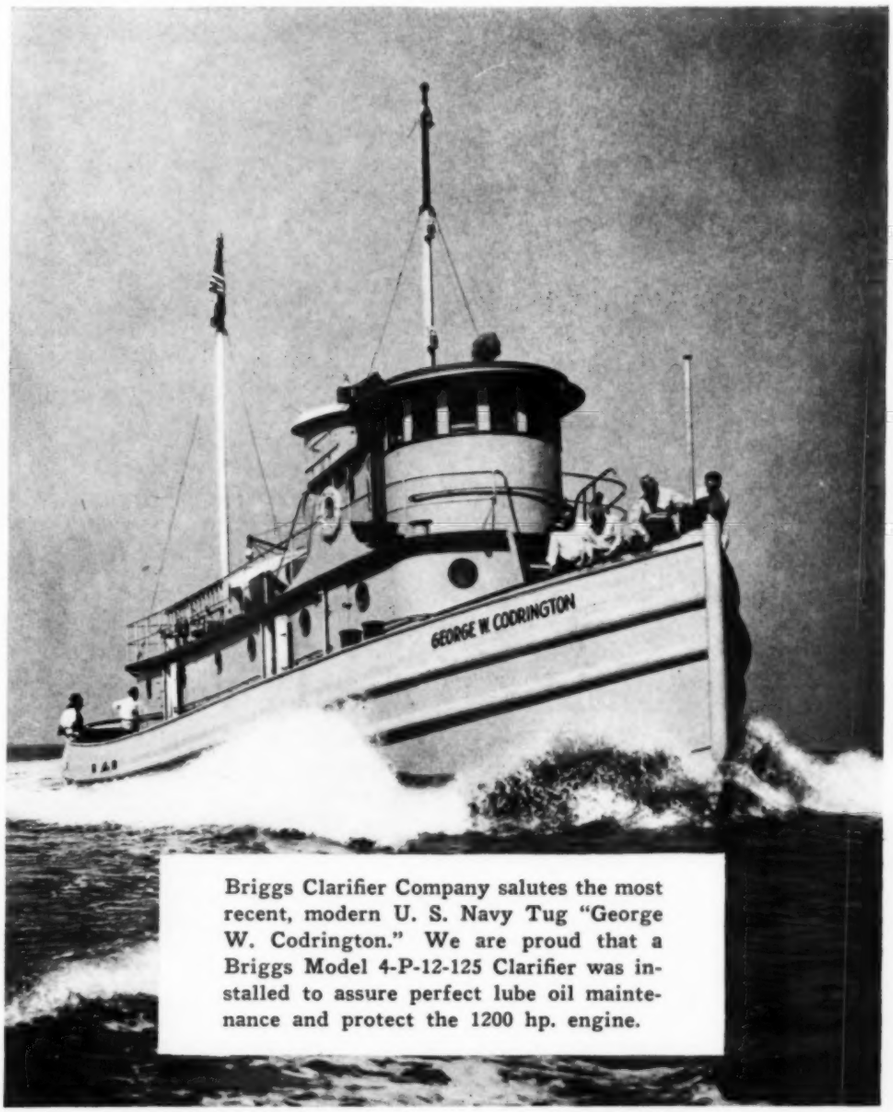
FRANK A. DONALDSON, President of Donaldson Company, Inc., 666 Pelham Blvd., St. Paul, Minnesota, wishes to announce the appointment of W. W. Lowther as Chief Engineer to succeed Fred R. Nohavec. John C. Enblom, who formerly represented the company in the Chicago territory, has been advanced to the position of Assistant Chief Engineer.

A NEW DIESEL SPORT-FISHERMAN BUILDING

JOHN H. WELLS, President of John H. Wells, Inc., Naval Architects, 444 Madison Avenue, New York, announces that construction has been started on a 61' Diesel-engined sport-fisherman which they have designed for Mr. Powel Crosley, Jr., President of the Crosley Corporation of Cincinnati, Ohio.

The new boat, now being built by Julius Peterson, Inc., at Nyack, N. Y., will have a beam of sixteen feet, draft of four feet two inches, and will have a cruising speed of fourteen miles. Accommodations are provided for eight in the owner's party, with a comfortable deck lounge, and a large fishing cockpit, equipped with fishwell, bait boxes, and glass-bottom well.

SID G. HARRIS is now Manager, Sales Engineering Department, Fleet-Industrial-Marine Division of Petroleum Solvents Corporation, 331 Madison Avenue, New York City. This company produces SILOO, LOOSITE, SILOO Fuel Oil Tank Solvent and other industrial solvents. He was formerly Factory Representative for Pines Winterfront Company, Sales Engineer for Macmillan Petroleum Corporation, and Eastern Representative for Continental Motors Corporation. He holds Member Grade in the Society of Automotive Engineers, and was Chairman of Metropolitan Section.



Briggs Clarifier Company salutes the most recent, modern U. S. Navy Tug "George W. Codrington." We are proud that a Briggs Model 4-P-12-125 Clarifier was installed to assure perfect lube oil maintenance and protect the 1200 hp. engine.

For information regarding your filtering problems write

BRIGGS CLARIFIER CO., 3262 K Street, N.W., Washington, D. C.

Manufacturers of Briggs Oil Clarifiers for Automotive Diesel Trucks, Tractors, Marine Diesels, Industrial Engines, Gas Engines, Gasoline Engines, Lubricating Systems.

FULTON BUSY

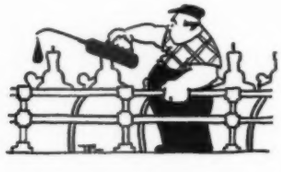
FULTON IRON WORKS, St. Louis, Missouri, is busy building a number of quite large engines. For instance, they have under construction at the present time a 1,500 hp. unit for the R.E.A. operation at Pocahontas, Iowa, making the second Fulton in this plant. Then they have nearly ready for shipment a 1,500 hp. unit for South River, New Jersey, which is one of the oldest municipal Diesel plants in the country. This will make the fourth Fulton at South River. There is a 1,500 hp. unit under construction for the municipal Diesel plant at Algona, Iowa. When installed, this will make the seventh Fulton for Algona. Fulton is also building a 750 hp. unit for the municipal power plant at Pawnee, Oklahoma.

NEW SYNCHRONOUS CLOCKS

TWO new Synchronous Program Clocks for operating time signals are now being manufactured by Zenith Electric Company, 845 South Wabash Avenue, Chicago, Illinois. Type P512 will operate a signal at any five minute period and Type PD124 will operate a signal at any one minute period.

These clocks have a large, legible 24-hour dial and a one-hour dial cam. Pointers, connected to a contact arm, ride the dials and permit the contact arm to fall only when preset time is reached.

These units are operated by heavy duty synchronous motors, and contact arrangements are such that absolute accuracy is assured. Contact can be so arranged as to operate a signal either in one ring or a coded ring, or for a definite duration of time, from 2 to 6 seconds. Units are compact and enclosed in dust-proof case. These clocks can be built to operate for many different purposes such as daily siren testing, timing industrial processes, and signaling the start and end operating periods. Prices range from $45.00 upward. Complete information can be had by writing this publication or direct to the manufacturer.



NEW BULLETIN

PENNSYLVANIA Flexible Metallic Tubing Co. has announced two new engineering bulletins, 59-G on All Metal Penflex Galvanized Steel Hose and Couplings; and 52-G on Bronze Steam Hose and Clincher Couplings. Both bulletins are extensively illustrated, include complete price and size data and are punched for standard three-ring binder. Get your copies of these important bulletins by writing direct to Pennsylvania Flexible Metallic Tubing Co., 72nd Street and Powers Lane, Philadelphia, Pa.

a coin will balance on edge on the Diesel supplying power for Springfield's largest department store.

McClintoch and Craig, Inc., Consulting Engineers, are to be congratulated on the successful Diesel installation recently completed for Forbes and Wallace of Springfield, Massachusetts. Difficult subsoil conditions and exacting department store requirements make this a noteworthy engineering accomplishment.

Korfund steel spring isolation once more makes Diesel economy available despite local foundation obstacles.

This 340 hp Worthington Diesel is cutting power costs to the bone at Springfield's largest department store. Korfund steel spring Vibro-Isolators support the integral concrete base of engine and generator, as shown. They successfully prevent the transmission of natural operating frequencies to the building structure in spite of river silt subsoil under the store.

KORFUND

COMPANY INC.

48-28 THIRTY SECOND PLACE LONG ISLAND CITY, N. Y.

NEWS AND NOTES

CRAMP Shipbuilding Company has received authorization from the Navy Department to begin spending $10,000,000 to restore their shipyard for national defense. The company has ordered machine tools costing over $1,000,000 needed for retooling the plant.

The Navy Department, it is understood, has awarded an order for the construction of six light cruisers of the Cleveland class to the Cramp Shipyard at a total cost of about $107,000,000 on a cost plus a fixed fee basis.

The Quartermaster Corps of the U. S. Army has awarded contracts for floating equipment to the value of $651,700 to the following concerns: The Allen Boat Company, Gretna, La., $40,450 for a Diesel-electric tugboat; the Palmer Scott Company, New Bedford, Mass., $44,250 for motor launches; and the Robinson Marine Construction Company, Benton Harbor, Mich., $47,000 for motor launches. The Army has also given the Higgins Industries, New Orleans, La., a contract for various types of boats to cost $520,000. Mr. Hugo Haas, who for so many years was with the U. S. Engineers in Washington, is now serving the Quartermaster Corps in connection with the floating equipment which this department is buying and will purchase.

The Navy Department has ordered the construction of three additional submarine tenders at a total cost of $50,000,000. Two of these vessels will be built at the Mare Island Navy Yard and the third at the Puget Sound Navy Yard at Bremerton.

The U. S. Engineer's office, now located in Philadelphia, will open bids on December 2 for the construction of two Diesel-electric powered sea-going hopper dredges to be delivered afloat in the Delaware River. Each dredge will be 211′ overall, 40′ beam, 15′ 6″ molded depth.

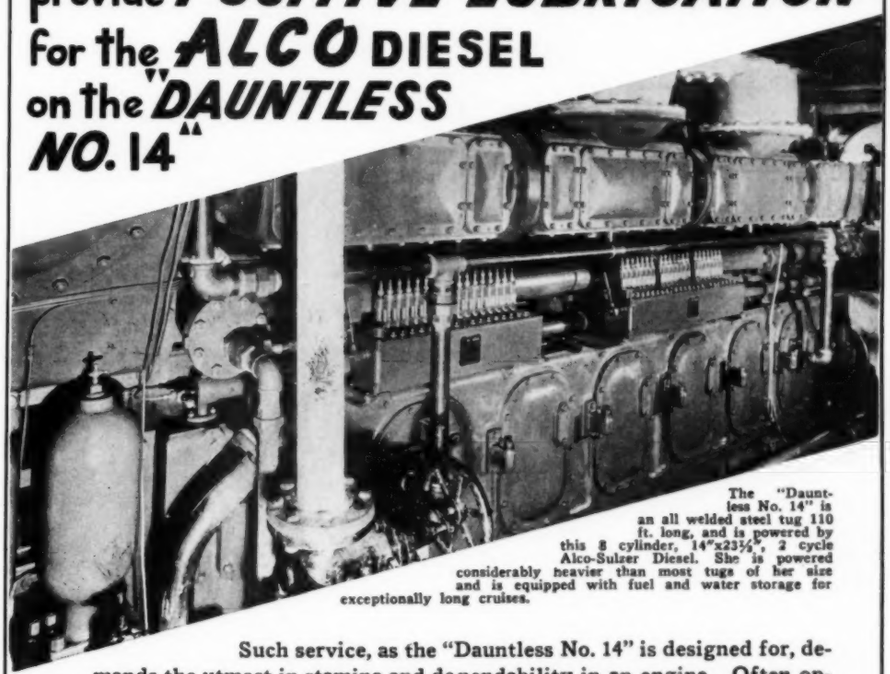
The Moran Towing and Transportation Company has ordered four more Diesel-electric tugboats from the Pennsylvania Shipyards Inc. of Beaumont, Texas. These new tugs are being purchased to replace four which Moran recently sold to the U. S. Navy. Diesel machinery will be furnished by the General Motors Corp.

The Levingston Shipbuilding Co. of Orange, Texas, has obtained an order from the River Terminals Corp. of New Orleans, La., for the construction of two Diesel tugboats. Each ship is to be powered with a 600 hp. Cooper-Bessemer engine, Kort nozzles, radio telephones, and will be characterized by the splendid facilities which are provided for the comfort and safety of the crew.

The Calumet Shipyard & Drydock Co. of Chicago, Ill., has obtained a contract from the Ashland Oil & Refining Co. of Ashland, Ky., for a new river towboat which is to act as a sister ship to the towboat *Jim Martin*. The new vessel will have a length of 140′, a beam of 31′, and a depth of 9′, and gross tonnage of 350. We understand that a Fairbanks-Morse Diesel engine has been ordered for this ship.

The Electric Ferries, Inc., of New York, who has been engaged in a new construction program all of this year, has placed a contract for the construction of a fourth ferryboat with the General Ship & Engine Works of East Boston, Mass. General Motors Diesel-electric machinery of some 900 shaft hp. will be installed and the ferry will have a capacity of 200 passengers and 50 automobiles.

MANZEL LUBRICATORS
provide *POSITIVE LUBRICATION*
for the *ALCO* DIESEL
on the "*DAUNTLESS NO. 14*"



The "Dauntless No. 14" is an all welded steel tug 110 ft. long, and is powered by this 8 cylinder, 14"x23½", 2 cycle Alco-Sulzer Diesel. She is powered considerably heavier than most tugs of her size and is equipped with fuel and water storage for exceptionally long cruises.

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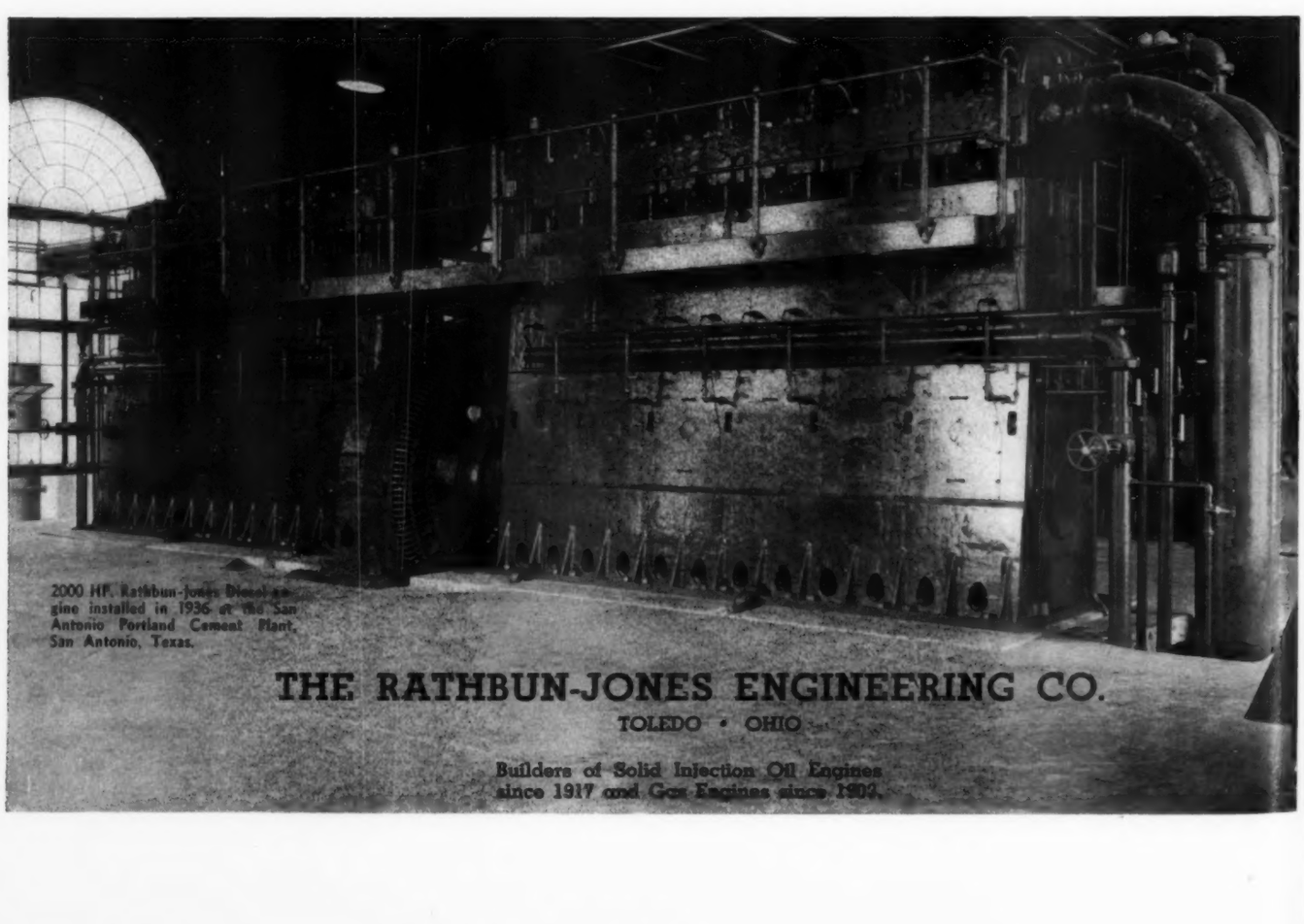
PORT ARTHUR, TEXAS. SHIPYARD BUSY

THE Gulfport Boiler and Welding Works, whose yard is situated on the Port Arthur ship canal at Port Arthur, Texas, has been and still is one of the busiest shipyards on the Gulf Coast. The illustration above shows, reading from left to right, the Diesel-electric tug *General,* which was later sold to the Card Towing Line Company and is now owned by the United States Navy; then comes one of their standard 8,500 barrel welded steel barges; then the Diesel Coast Guard cutter *Mahoning,* and adjoining the Diesel Coast Guard cutter *Arundel.* These four vessels typify the work which is carried on by this highly efficient shipyard.

Back in 1931, Bruno R. Schulz, President and General Manager of the Gulfport Boiler and Welding Works, set up a small welding shop on the canal bank at their present location and started building welded steel barges. The step from barge building to towboat building was but a natural and necessary one. It was found that the two went hand in hand and that frequently barge contracts were placed in the same yard which could also build towboats. This Port Arthur Yard has built many fine tugs and barges including the *Atlas, Sampson, Hercules,* and *Vulcan* for the Sabine Towing Company of Port Arthur; the *Black* and the *Picto* for the Picton Towing Company of Port Arthur; the *Raymond Card* for the Card Towing Line; the *G. B. Zigler* for the G. B. Zigler Company, Jennings, Louisiana; the *Elizabeth Boyer* for the Interstate Oil Transport Company, Philadelphia, Pa.; the *Jupiter* and *Polaris* for Butcher-Arthur Transportation Company, Houston, Texas; the two Diesel Coast Guard cutters *Arundel* and *Mahoning,* and the Diesel-electric tug *George W. Codrington,* which is now owned by the United States Navy.

The organization of the Gulfport Boiler and Welding Works, Inc., is made up of Bruno R. Schulz, President and General Manager; G. W. Meier, General Superintendent; E. W. McCarthy, Chief Engineer; U. A. Schulz, Construction Superintendent; and George D. High, Welding Superintendent. As we go to press, word comes to us that this yard has obtained orders for four more tugs of the same general characteristics of the *George W. Codrington,* described in detail on pages 24, 25 and 26 of this issue.


2000 HP. Rathbun-Jones Diesel engine installed in 1936 at the San Antonio Portland Cement Plant, San Antonio, Texas.
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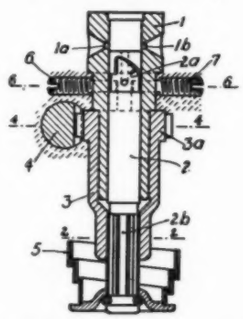
Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

2,187,732
FUEL INJECTION PUMP FOR DIESEL ENGINES
Kalman John De Juhasz, State College, Pa.
Application February 14, 1936, Serial No. 63,933
1 Claim. (Cl. 103—41)

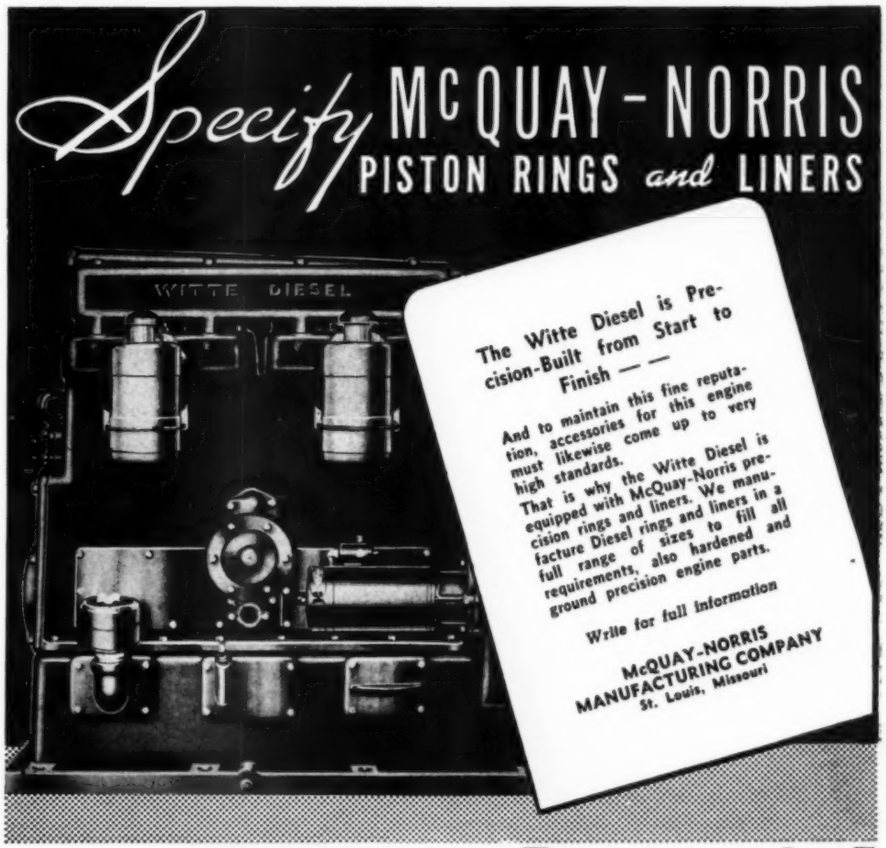


In a fuel injection pump in combination, a body, a barrel inserted into the said body, a plunger operating within said barrel as a pump for the pressure delivery of fluid, inlet and by-pass ports on the barrel and co-acting edges on the plunger controlling the beginning and end of fluid delivery, a control-sleeve coaxially surrounding a portion of said barrel, said barrel having stepped outside diameters along its length, the diameter of said barrel fitting into said body being larger than the diameter of the adjoining portion of said barrel which is surrounded by said control-sleeve, two axially extending notches formed on that portion of said barrel that fits into said body, said notches extending into the shoulder formed between said larger and said smaller diameter barrel portions, two screws threaded into said body the screw axes being in a plane perpendicular to the axis of said barrel and each screw abutting with its end against one of said notches on said barrel, said screws being capable of rotating said barrel in opposite senses around the axis of said barrel with reference to said body for the purpose of fine adjustment of the quantity of delivery, the ends of said screws being outside of the smaller diameter of said barrel adjoining to that larger diameter which fits into said body whereby endwise removal and replacement of said barrel into said body becomes possible upon loosening one of said screws and without disturbing the setting of said barrel as fixed by the other screw.

2,188,262
DIESEL FUEL
George S. Crandall, Woodbury, N. J., assignor to Socony-Vacuum Oil Company, Incorporated, New York, N. Y., a corporation of New York
No Drawing. Application December 2, 1938, Serial No. 243,507
9 Claims. (Cl. 44—9)

1. An improved Diesel fuel having in admixture therewith a minor proportion of a substituted pentazdiene in sufficient amount to decrease the ignition delay period of the fuel.

* Patent Attorney, 811 E. Street, N.W., Washington, D. C.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TOP RIGHT: Twin Disc Reduction Gear.
RIGHT: Twin Disc Power Take-Offs are standard equipment on the Witte Industrial Diesel Engine: 4-cylinder, 40 hp. (below).
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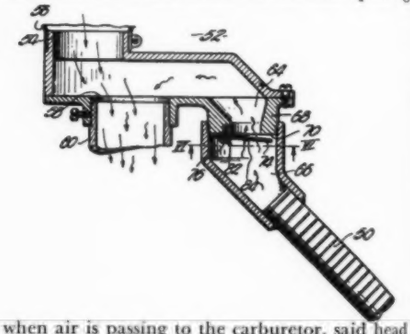
2,185,501

BREATHER SYSTEM FOR INTERNAL COMBUSTION ENGINES

Adolph C. Dressler, Miami, Okla., assignor to Dieselair Corporation, Miami, Okla., a corporation of Delaware

Application May 15, 1939, Serial No. 273,650
2 Claims. (Cl. 123—119)

1. The combination with an internal combustion engine having a carburetor provided with an air intake, a crank case for holding lubricating oil, and a block having cavities formed therein in communication with the crank case, of means for conveying vapors evolved within the crank case and said cavities to the air intake of the carburetor, said means including a conduit; a chambered head on one end of the conduit provided with an air intake port, an air outlet port, and an opening for receiving one end of the conduit; and structure on the other end of the conduit for placing the latter in communication with the crank case and cavities in the block, said ports being disposed to create vacuumatic action at the said opening



when air is passing to the carburetor, said head having a perforated flap valve loosely mounted therein for movement to and from a position for partially closing the opening when the vacuumatic action reaches a predetermined point, said valve being held open by the action of gravity thereon when the vacuumatic action ceases.

2,177,724

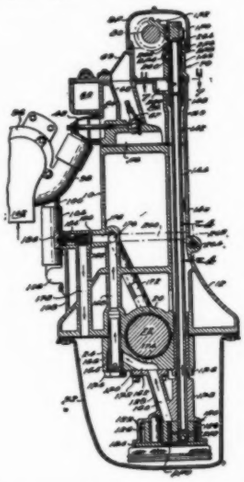
LUBRICATION SYSTEM FOR INTERNAL COMBUSTION ENGINES

Floyd F. Kishline, Birmingham, Mich., assignor to Graham-Paige Motors Corporation, Detroit, Mich., a corporation of Michigan

Application April 23, 1937, Serial No. 138,539
6 Claims. (Cl. 184—6)

1. In combination with an internal combustion engine having an oil pan at the bottom thereof, a cam shaft at the top thereof and valve tappets at the top thereof operable by said cam shafts, an oil pump in said oil pan, a hollow rotatable shaft extending from the lower portion of said engine to a point adjacent said cam shaft and having its bore closed at its upper end, means for driving said hollow shaft, means for introducing oil from said oil pump into the interior of said hollow shaft, said hollow shaft having a passage through a side wall thereof adjacent its upper closed end, stationary means surrounding the upper end portion of said hollow shaft and having a passage therethrough registerable with said passage in said shaft during rotation of said shaft therein, a horizontally extending oil conduit adjacent the top of said engine, other conduits connecting said conduit with said tappets, and

means effecting communication between the first mentioned conduit and the interior of said hollow shaft at a point downwardly spaced from said passage whereby air bubbles carried



by the oil introduced into said hollow shaft will tend to flow upwardly beyond the point of intercommunication between the interior of said hollow shaft and said first mentioned conduit to the upper end of said hollow shaft and will be ejected therefrom through said registerable passages.

2,180,352

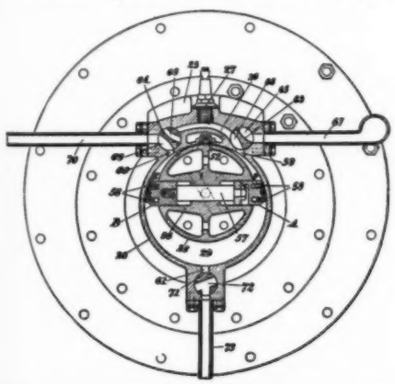
ROTARY INTERNAL COMBUSTION ENGINE

Delmar S. Fahrney, United States Navy

Application March 9, 1938, Serial No. 194,883

3 Claims. (Cl. 123—16)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)



1. A rotary internal combustion engine comprising a cylindrical casing; a cylindrical member of less diameter than said casing rotatably mounted in said casing in excentric tangent relation thereto to provide an expansion chamber therebetween, said casing having a fuel inlet port and an exhaust port communicating with said chamber on opposite sides of the line of tangency between said rotatable member and said casing; vanes slidably mounted in said rotatable member for sealing contact with the wall of said expansion chamber; a firing chamber in said casing and communicating with said expansion chamber on opposite sides of said line of tangency; a valve for controlling communication between said fuel inlet port and said expansion chamber and between said firing chamber and said expansion chamber; and means driven by said rotatable member for actuating said valves in timed relation to one another.

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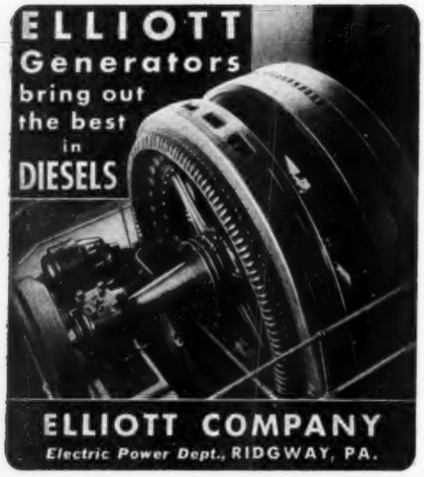

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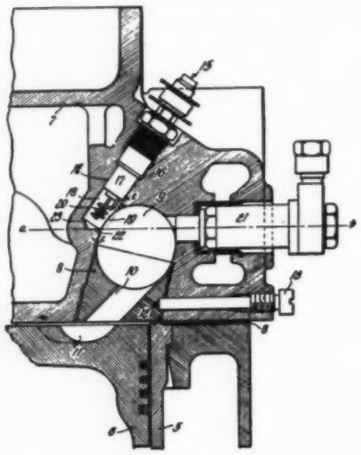
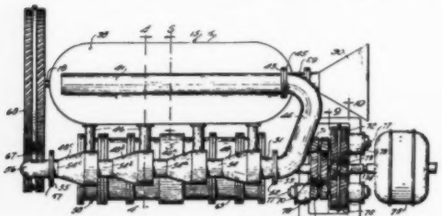
2,189,082
INJECTION ENGINE
Arthur W. Pope, Jr., Waukesha, Wis., assignor to Waukesha Motor Company, Waukesha, Wis., a corporation of Wisconsin
Application September 16, 1938, Serial No. 230,311
1 Claim. (Cl. 123—32)



In an injection engine, a cylinder and a piston operating therein, a head overlying said cylinder, a substantially spherical combustion chamber in said head opening into said cylinder through a restricted passage the upper end of which opens into said combustion chamber at the lower portion of and substantially tangent to one side thereof, an injection nozzle having a tip at said one side of said combustion chamber directly above said passage substantially in the vertical plane of the latter and disposed to inject a stream of fuel across said combustion chamber toward the opposite side thereof, said head having a pocket communicating with said combustion chamber at said opposite side thereof through an opening in a plane of a chord of said combustion chamber and substantially aligned transversely of the latter with the tip of said nozzle and said fuel stream, and electrical ignition means disposed within said pocket and wholly exterior of said combustion chamber.

2,188,444
COMBINED INTERNAL COMBUSTION ENGINE AND COOLING SYSTEM
Urban Sauer, Pittsburgh, Pa., assignor of one-third to Harry R. Levy, McKeesport, Pa.
Application July 6, 1938, Serial No. 217,764
7 Claims. (Cl. 60—13)

1. In combination, an internal combustion engine including a bank of spaced cylinders having intakes and exhausts, a low pressure turbine operatively connected with and driven from said engine, said turbine provided with an intake for a mixture of a cooling medium



and exhaust gases, a jacket common to and enclosing in spaced relation said cylinders, said jacket being formed with horizontally disposed means to provide therein superposed communicating cooling medium receiving chambers surrounding said cylinders, said lower chamber having a cooling medium inlet, said upper chamber being provided with a cooling medium outlet, a hollow structure mounted on said jacket forming a cooling medium receiving chamber having a plurality of spaced outlet ports, the outlet of the upper chamber formed by the jacket opening into said third chamber, a Venturi forming means having a cooling medium intake and an outlet for said mixture permanently opening into the intake of the turbine, a cooling medium conducting-off means common to said outlet ports and opening into the intake of the said Venturi forming means, and means leading from the exhausts of said cylinders for conducting off exhaust gases and for delivering same into said Venturi forming means at spaced points of the length of the latter.

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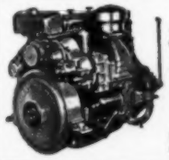

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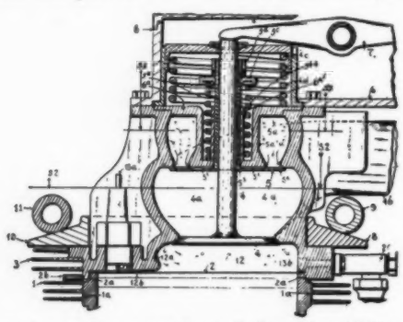
L C Smith & Corona Typewriters Inc
330 Fifth Avenue
New York, New York

2,191,745
INTERNAL COMBUSTION ENGINE
Jean A. H. Barkeij, Altadena, Calif.
Application March 31, 1934, Serial No. 718,420
14 Claims. (Cl. 123—79)

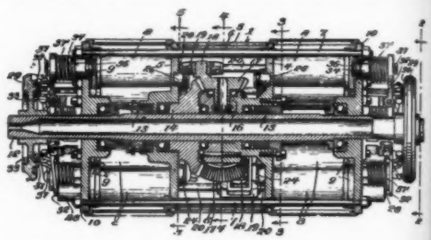
1. In a fourstroke cycle internal combustion engine, the combination of a cylinder having a valve in the head thereof arranged at one side of the cylinder and a Venturi shaped passage around said valve so that said valve is located substantially at the narrowest part of said Venturi passage the widest passage of said Venturi shaped passage being located above the narrowest part thereof so that the distance between the widest and narrowest part is substantially at least half the diameter of said valve said engine being of the compression ignition type in which said cylinder is provided below said valve with a deflecting wall extending around a part of the periphery of said valve said wall being concave and curved towards the exit part of said deflecting wall to impart



to the aircharge accelerated through said Venturi passage a high rotational velocity, and a fuel nozzle arranged to direct the fuel within said cylinder transversely of the rotating mass an inlet conduit leading to said Venturi passage, the approach of said inlet conduit being tangentially to said cylinder and being substantially above said deflecting concave wall.

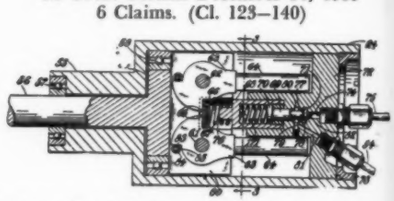
2,188,630
INTERNAL COMBUSTION ENGINE
Frederick P. Grahman, Port Orange, Fla.
Application October 18, 1937, Serial No. 169,734
1 Claim. (Cl. 123—58)

In an engine of the type described, a pair of power cylinders arranged in side by side relation, a piston operable in said cylinders and dividing each into a compression chamber and a firing chamber, a fuel supply means, a single fuel inlet valve communicating with the fuel supply means, said fuel inlet valve having direct communication with each of the compression chambers, each firing chamber being provided with an exhaust valve, each piston being formed with a fuel passage for effecting communication between its respective compression and firing chambers, a check valve associated with each piston for closing its passage to effect opening of said fuel intake valve to permit fuel to be drawn into the compression chamber upon movement of the piston in one direction and said check valve being operable to open the passage to permit fuel to be introduced into the



firing chamber from the compression chamber upon movement of the piston in an opposite direction and to effect closing of said fuel intake valve, a single detonator cylinder having communication with each of said firing chambers, a detonator piston operable in said last cylinder for compressing fuel therein to ignite the same, and means for operating said detonator piston.

2,191,186
FUEL INJECTION SYSTEM FOR INTERNAL-COMBUSTION ENGINES
George Amery, London, England
Application December 28, 1936, Serial No. 117,964
In Great Britain December 31, 1935
6 Claims. (Cl. 123—140)



1. In a fuel injection system the combination of a pressure conduit, a relief valve for limiting the maximum injection pressure in said conduit, means for modifying the pressure at which the relief valve will operate in accordance with the engine speed, said means comprising a centrifugal governor operatively connected by resilient means to the relief valve, said relief valve comprising a valve member having a stem extension of smaller diameter than its normal head and fitting into said pressure conduit whereby an increase of injection pressure is provided at the commencement of operation.

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● Columbia A. C. Generators are quality built and attractively priced for resale by engine builders and dealers.

Sizes: 1 to 300 KVA
Speeds 1800, 1200, 900, 720, 600, 514, 450 R.P.M.
Single or 3 Phase

Furnished with either direct connected or belted exciter. Stock shipment.

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COLUMBIA ELECTRIC MFG. CO.
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AN EASY WAY TO CLEAN YOUR LUBE OIL COOLERS

Want to save time, save money in cleaning your oil coolers? Then investigate the successful, low-cost Oakite method. No dismantling of unit necessary! Circulation of recommended Oakite solution through system speedily, thoroughly removes carbonized oil deposits. Heat transfer efficiency is restored . . . lube oil is maintained at proper temperature. Interesting data FREE on request.

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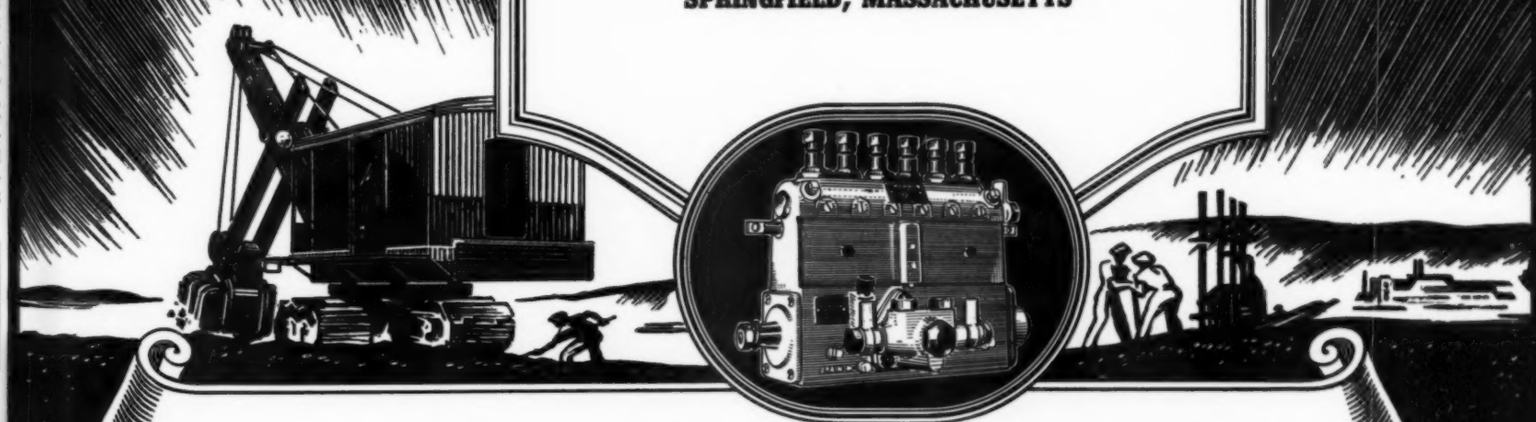
22D Thames St., New York

OAKITE *Certified* **CLEANING**

NATURALLY it is a satisfaction to be recognized as the leader..or the largest..or the liveliest in any field..as American Bosch is regarded in the realm of Diesel Fuel Injection Equipment.

But the deeper, more gratifying achievement is to earn the reputation, as American Bosch has earned it, for friendliness; unselfish cooperation; bulwark-like dependability.

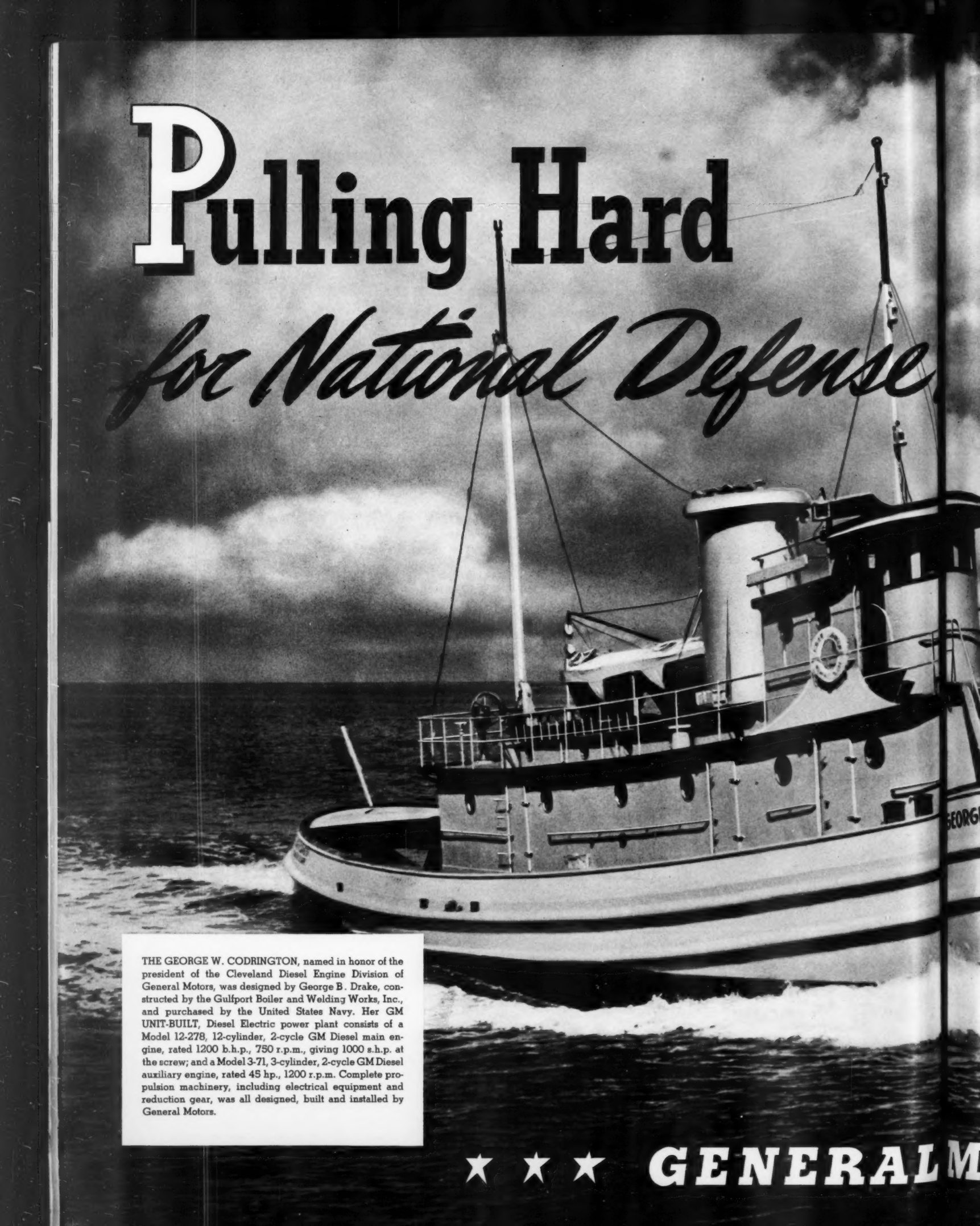
AMERICAN BOSCH CORPORATION
SPRINGFIELD, MASSACHUSETTS



AMERICAN BOSCH
Fuel Injection STANDARD OF AMERICA WORLD WIDE SERVICE *Equipment*

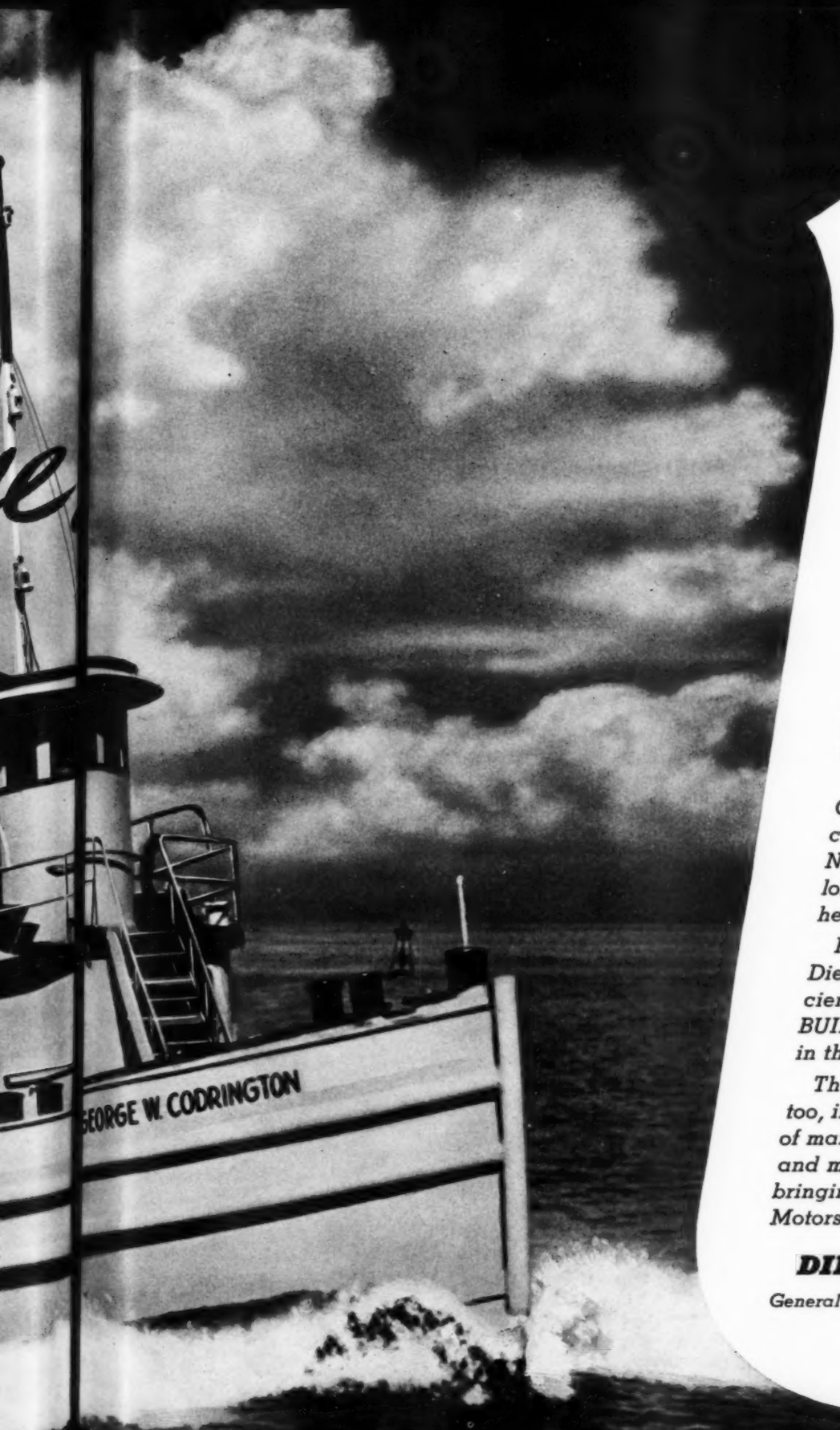
Pulling Hard

for National Defense



THE GEORGE W. CODRINGTON, named in honor of the president of the Cleveland Diesel Engine Division of General Motors, was designed by George B. Drake, constructed by the Gulfport Boiler and Welding Works, Inc., and purchased by the United States Navy. Her GM UNIT-BUILT, Diesel Electric power plant consists of a Model 12-278, 12-cylinder, 2-cycle GM Diesel main engine, rated 1200 b.h.p., 750 r.p.m., giving 1000 s.h.p. at the screw; and a Model 3-71, 3-cylinder, 2-cycle GM Diesel auxiliary engine, rated 45 hp., 1200 r.p.m. Complete propulsion machinery, including electrical equipment and reduction gear, was all designed, built and installed by General Motors.

★ ★ ★ GENERAL M



Speed — maneuverability —dependability. These are the watchwords when the U. S. Navy orders new craft these days.

And when it comes to tugboats, there's plenty proof that the outstanding performer on all three of these counts is a GM UNIT-BUILT Diesel Electric Drive.

Thus in the Navy's newest ocean-going tugboat, you'll find just such a power plant—with its main and auxiliary Diesels, electrical equipment and reduction gear all designed, built and installed by General Motors.

This recently launched vessel, the GEORGE W. CODRINGTON, was purchased to serve in the United States Navy, where both sustained speed over long distances and high efficiency under heavy load are paramount requirements.

Here the famed versatility of the GM Diesel plus the made-for-each-other efficiency of all equipment in a GM UNIT-BUILT installation were important factors in the selection of this power plant.

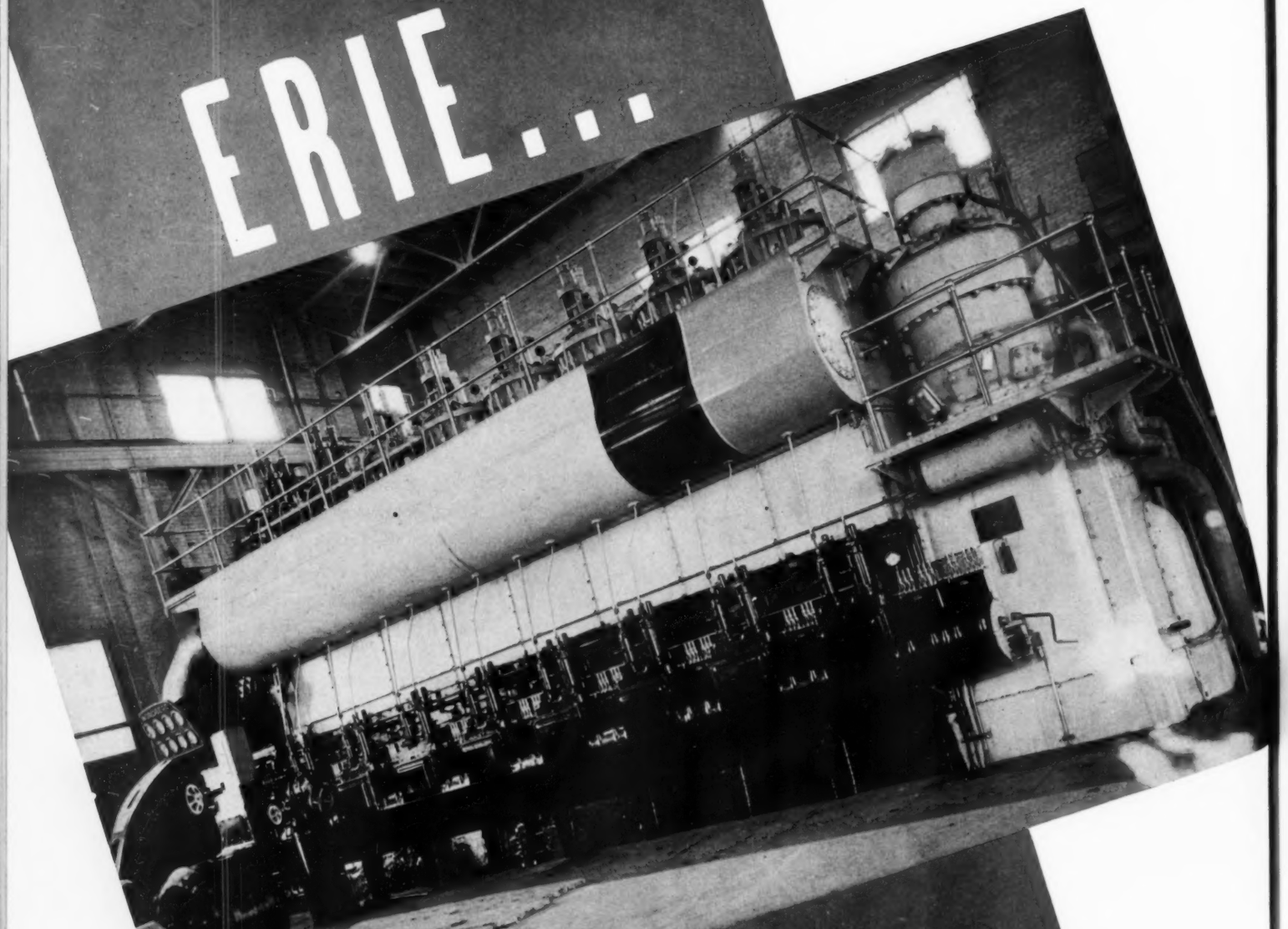
They're important factors to consider, too, in the powering of commercial vessels of many different kinds. So no wonder more and more marine operators every year are bringing their power problems to General Motors first.

DIESEL ENGINE DIVISION

General Motors Sales Corporation, Cleveland, Ohio

ALMOTORS DIESEL

ERIE...



Representative of the essential services we render to Diesel engine builders are the crankshafts, connecting rods, and other forged parts supplied to Nordberg Manufacturing Company for the construction of this new 3200 hp. Diesel installed at Bryan, Ohio.

The facilities of our plant are placed at the disposal of engine builders to produce the essential forgings to insure smooth performance.

ERIE FORGE COMPANY, ERIE, PENNSYLVANIA

You Can't Drive a Spike

...with a Tack Hammer!

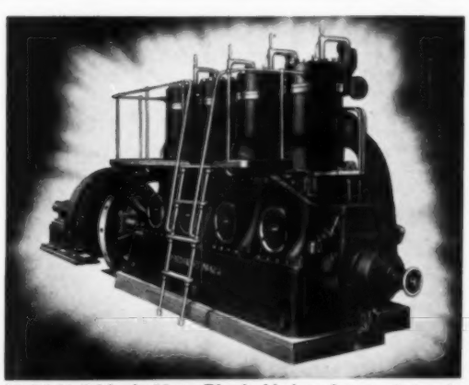
TACK HAMMERS are useful tools—but not for driving heavy spikes. That takes a *heavy-duty* hammer.

For heavy-duty power jobs, Fairbanks-Morse recommends the slow-speed, two-cycle, *heavy-duty* Diesel . . . for identically the same reason that you can't drive a spike with a tack hammer.

Slow speed reduces wear on moving parts. That is *important* where an engine must operate months on end without servicing. Maintenance cost records show just *how* important!

The simpler, two-cycle principle reduces moving parts to a minimum. Service is easier and costs much less. *Operating cost records prove* THAT, *too!*

Yes, where there's a hard job of work to be done—take a tip from the broadest Diesel experience in the world and *put a work Diesel on the job*—a Fairbanks-Morse Diesel of the s-l-o-w-speed, two-cycle type. For detailed information, write Fairbanks, Morse & Co., Dept. 23, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the U. S. and Canada.



Model 32 Fairbanks-Morse Diesel; this is a slow-speed, 2-cycle engine built for heavy-duty service in mine, mill, factory—or wherever *long, continuous, heavy-duty, low-cost power* is a *must.*

7832-OA40. 172

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DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
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WATER SYSTEMS
WASHERS-IRONERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

F-M

Diesels

DIESEL PROGRESS for December, 1940. Volume VI, Number 12. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized May 27, 1940. Subscription rates: United States and Possessions $3.00. Canada and all other countries $5.00 per year. Single copy price 25 cents in U. S. A., 50 cents for all other countries.

ICE never melts here

. . . forced shut-downs never occur thanks to SUN SOLNUS OILS

7000 hours (approx.) of uninterrupted operation in one year . . .
The case history of an ice plant's* three Diesel engines.

6 years of consistent performance . . .
Prior to 1934 these engines had to be pulled down twice a year because of ring wear and carbon formation. Since then they have lubricated with Sun Solnus Oils — resulting in . . . no more forced shut-downs . . . and only one general overhaul period a year.

Savings estimated at 35% . . .
The savings in oil consumption now total an average of 240 gallons a year — thanks to Solnus Oils.

Why not let us tell you more about these performance-proved Diesel Lubricants and have a Sun Technical Representative make specific recommendations for your plant? Write us today.

*Name of manufacturer on request.

SUN OIL COMPANY · PHILADELPHIA, PA.

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SUN PRODUCTS INCLUDE:

SOLNUS OILS
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(Metal Cleaning and Paint Thinners)

SUN QUENCHING AND TEMPERING OILS

SUN OILS

PETROLEUM PRODUCTS FOR ALL INDUSTRIES

Atlas Diesels keep Rolling through the Years at Very Moderate Cost

There is an old saying that, if a thing happens once it is an ACCIDENT, if it happens twice it is a COINCIDENCE, and if it happens three times it is a HABIT.

The excellent performance of Atlas Diesels for the American Tug Boat Co. of Everett, Washington, is not confined to one boat. Pictured here are four of their tugs with the records of their performance.

Basing his conclusions on the records of Atlas Diesels in these four work boats, Mr. Ben McLennan, port engineer of this company says: "Atlas Diesels are good, reliable engines, any way you look at them. They never fail to start, due to any fault of the engine. They always bring their boats home. They keep rolling throughout the years at very moderate cost."

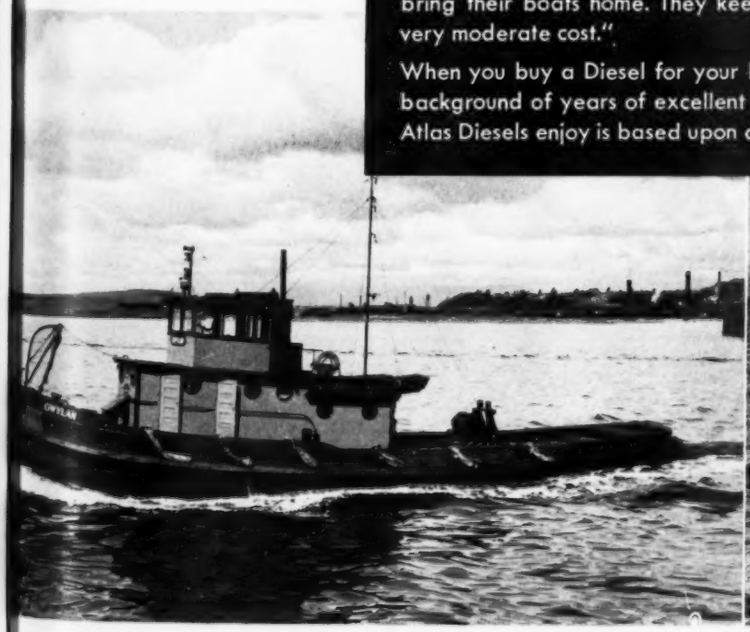
When you buy a Diesel for your boat, select an engine that has a background of years of excellent performance. The reputation that Atlas Diesels enjoy is based upon dependable performance records.

"Chickaloon," powered by a 125 H.P. Atlas Diesel, which has piled up 26000 operating hours.

"Gwylan," powered by a 200 H.P. Atlas Diesel which has operated 34000 hours in 8 years.

"Arlyn Nelson," powered by a 90 H.P. Atlas Diesel, has operated 27000 hours in 9 years.

"Boston II," whose 90 H.P. Atlas Diesel has run over 24000 hours in 8 years of operation.



ATLAS IMPERIAL DIESEL ENGINE CO.

EASTERN DIVISION . . . . . 115 BROAD STREET, NEW YORK, N. Y.
CENTRAL DIVISION . . . . 228 NO. LA SALLE STREET, CHICAGO, ILLINOIS
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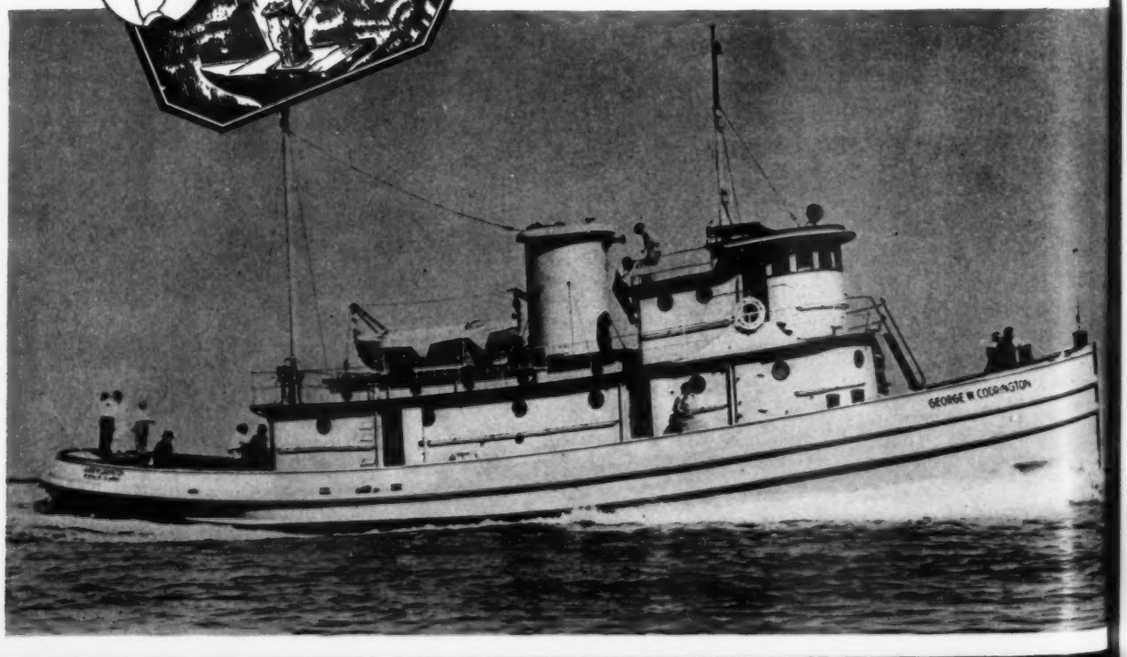
WESTERN DIVISION . . 1000 NINETEENTH AVENUE, OAKLAND, CALIFORNIA

ATLAS Imperial DIESEL ENGINES

Congratulations to Mr. Codrington for having the outstanding Diesel-Electric Tug of the year, *George W. Codrington,* named after him. This Tug was recently built by the Gulfport Boiler & Welding Works of Port Arthur, Texas, and delivered to the United States Navy at Key West for service in the new Navy fleet bases in the Caribbean.

Satco* metal is in use in the bearings made by the American Bearing Corporation for this tug. Satco* metal is in use in thousands of other bearings we have been privileged to make for the United States Navy. The unique qualities of this metal for Diesel engine bearings, plus our many years of experience in designing and building Diesel bearings, peculiarly fits us to be the Bearing Headquarters of the Diesel Industry.



** A patented alloy manufactured by National Lead Company. Trade-Mark Registered.*

AMERICAN BEARING CORPORATION

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IT IS NEVER COSTLY TO USE ALCOA ALUMINUM RIGHT

ALUMINUM GIVES YOU ALL THREE

and then some!

You want a lightweight Diesel engine. The space into which it must go is limited. There dare be no question about its ability to stand up on the job.

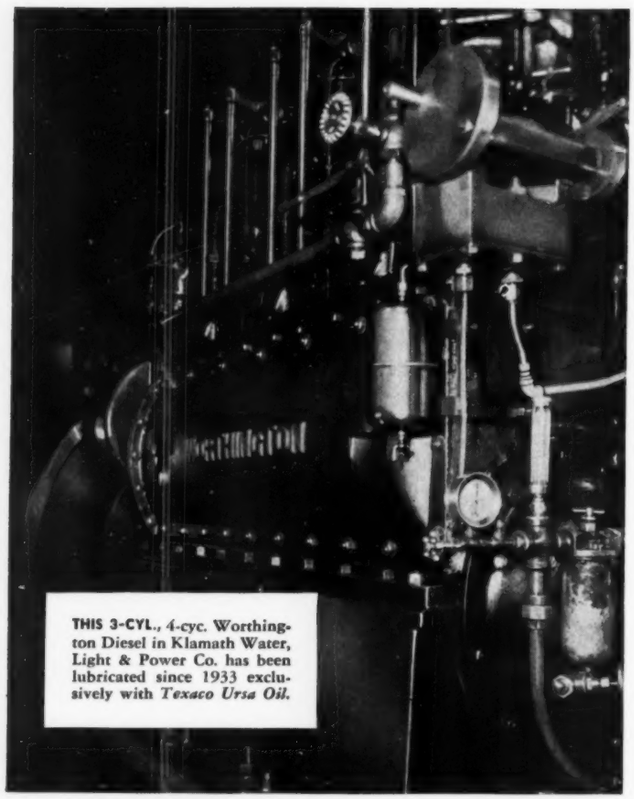
¶ Aluminum Alloy construction enables the builder to give you an engine exactly meeting these requirements: light in weight, compact, reliable.

¶ Structural parts of Alcoa Aluminum Alloys can be thick and strong, without sacrificing lightness. No need to resort to thin sections and complicated stiffening members. Fabricating processes are simplified. Parts are produced at lower cost. Maintenance of these Aluminum structures is easier and less costly.

ALUMINUM COMPANY OF AMERICA, 2141 GULF BUILDING, PITTSBURGH, PA.

ALCOA ALUMINUM

46,000 Hours, Original Rings!



THIS 3-CYL., 4-cyc. Worthington Diesel in Klamath Water, Light & Power Co. has been lubricated since 1933 exclusively with *Texaco Ursa Oil.*

AVERAGING 18 hours a day for 7 years in the Klamath (Calif.) Water, Light & Power Company plant, this 50-kw. Worthington Diesel's performance data show—

1. *Never a stuck ring.*
2. *Original rings still in use.*
3. *Liner wear only .008" at top; not measurable at bottom.*

Throughout these 7 years the only lubricant used was *Texaco Ursa Oil.*

Texaco Algol and *Ursa Oils* resist the formation of gum, sludge and hard carbon. They provide a tough, wear-defying lubricating film that withstands high temperatures and pressures.

Your Diesel engines, whether large or small, will operate better on Texaco.

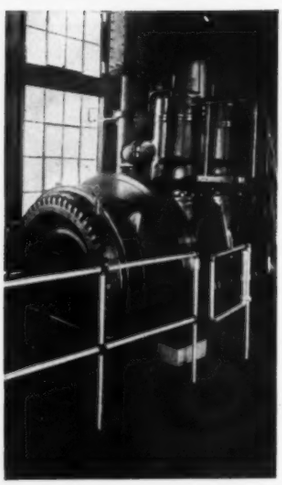
In fact . . . *more stationary Diesel horsepower in the United States is lubricated with Texaco than with any other brand.*

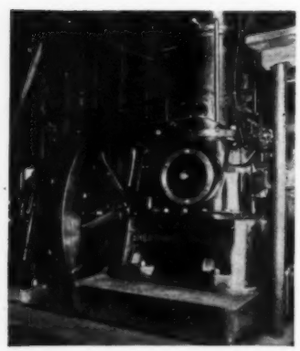
Trained lubrication engineers will gladly cooperate in making savings with *Texaco Algol* or *Ursa Oils* in your Diesels. Phone the nearest of more than 2300 Texaco warehousing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

WEAR in the Worthington cylinders was only .008 in. at top after 7 years of 18-hour-a-day operation on *Texaco Ursa Oil.*

NEVER A FAILURE . . . which could be attributed to the oil . . . not even a shut-down reports Blue Line Hosiery Mills, Inc., Denver, Pa., referring to their 2-cyl. F-M Diesel *(right)*. They use Texaco Diesel lubricants exclusively.





THIS 1-CYL., 2-cycle F-M unit is also giving an excellent account of itself in the Klamath plant . . . thanks to 7 years on *Texaco Ursa.*

TEXACO DEALERS INVITE YOU TO ENJOY

FRED ALLEN in a full-hour program every Wednesday night. CBS, 9:00 E.S.T., 8:00 C.S.T., 10:00 M.S.T., 9:00 P.S.T.

METROPOLITAN OPERA every Saturday afternoon, NBC. See local newspaper for time and station.

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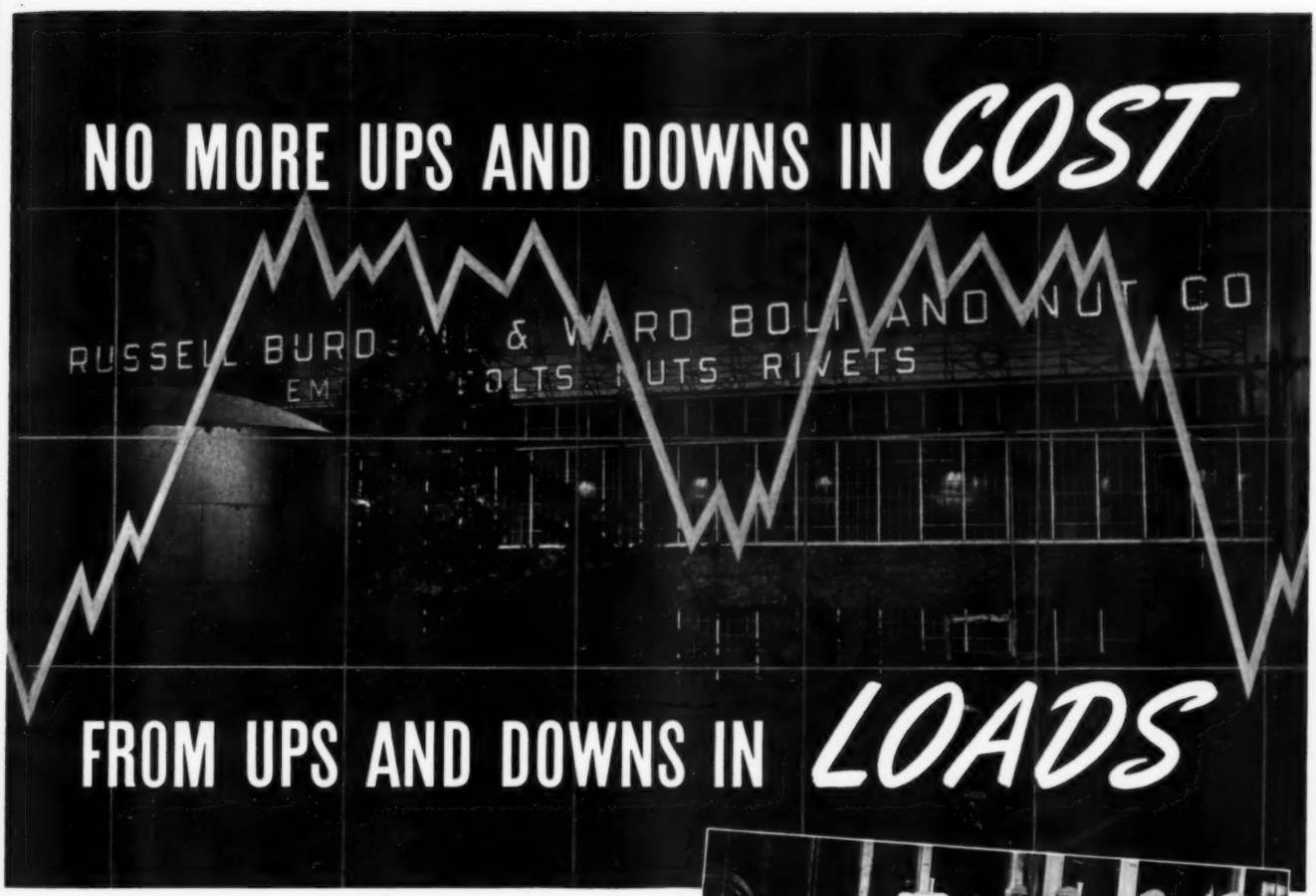
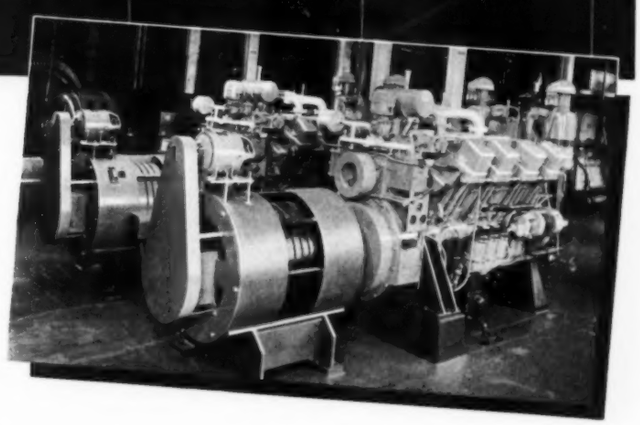
TEXACO Algol and Ursa Oils

NO MORE UPS AND DOWNS IN *COST*



FROM UPS AND DOWNS IN *LOADS*



To the Russell, Burdsall & Ward Bolt and Nut Co., Rock Falls, Illinois, overload peaks and week-end minimums used to be a headache in stand-by and demand power-costs. But two "Caterpillar" Diesel D17000 Engines, each coupled to a 100-kw. generator, now give their regular power equipment a lift when there's an emergency or an extra load. They also take over when partial operation or shut-down calls for fractional capacity. Thus has a progressive manufacturing concern solved the problem of excessive power-costs during abnormal or subnormal operating periods of the day or week . . . with economical, *flexible* power under their own control.

"Caterpillar" Diesel Engines or Electric Sets* can probably serve similar profitable uses in *your* plant — just as they are doing in the above and many other plants throughout the world. They are cheap insurance against complete power failure — and, at the same time, contribute to high over-all power-plant efficiency. Coupon brings further facts.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

* **SIMPLE AND SOUND IN DESIGN** — easy to care for (no frequent or delicate adjustments).

* **BUILT FOR LONG LIFE** under the most severe types of power requirements.

* **EXCLUSIVE FUEL SYSTEM.** No operating adjustments. . . . Clean, economical burning of fuel at all loads and speeds. Uses wide range of fuels, including No. 3 furnace oil.

* **HIGH-QUALITY CONSTRUCTION** — supplemented by the world's most complete and readily available engine parts-and-service facilities.

CATERPILLAR TRACTOR CO., *Dept. DP-12*, Peoria, Ill.

We require about_____hp.; or_____kw. per hour for ☐ regular, ☐ stand-by power. Send information on ☐ Diesel Engines ☐ Diesel-Electric Sets.

*Name*_____

*Address*_____

CATERPILLAR

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DIESEL ENGINES AND ELECTRIC SETS

PUROLATOR-EQUIPPED...

She's off to join the Navy

Two Purolator types widely used in modern Diesel plants

One result of Purolator's constant development work is the new N-2900 Purolator—a new replaceable element lubricating oil filter for engines on continuous heavy-duty work. The N-2900 Purolator is recommended for Diesel engines from 35 to 50 h.p., for gasoline or gas engines from 40 to 100 h.p., where used in continuous, severe service.

For the fuel line, DN-Type Purolators, mounted on the pressure side of the fuel transfer pump just ahead of the injection pump, remove the extremely fine foreign particles that would seriously damage the injection system. When the filtering element becomes saturated, it shuts off all flow. No dirty fuel is ever allowed to pass.

Yes, sir, it's the George W. Codrington—the brand new 1200 h.p. Diesel-electric ocean-going tug described in this issue of Diesel Progress. Recently acquired by the U. S. Navy, its sturdy General Motors Diesel power-plant is provided with the world's best protection against dirty oil.

There are two types of Purolator that guard against abrasive, clogging dirt—the constant menace to efficient Diesel performance. Lube oil filters keep crank case oil clean and free from sticky gums and hard carbon. Fuel filters guard against abrasive action that is almost certain to lead to costly damage in the fuel injection system. In both cases, the safe way to protect against dirty oil is to . . .

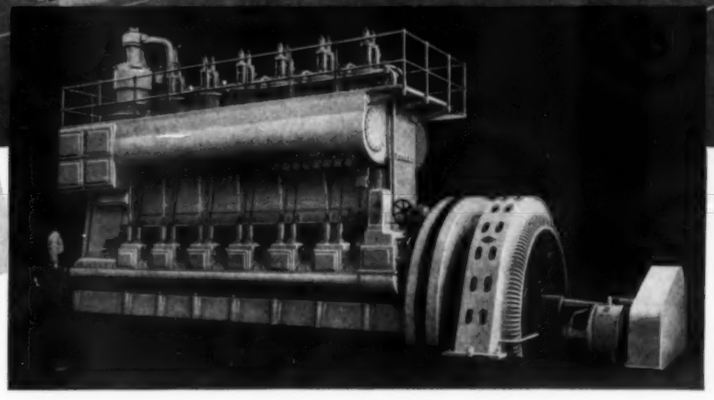
KEEP IT CLEAN with PUROLATOR

With a complete line of filters for both lubricating and fuel oils, Purolator saves money and worry for thousands of Diesel operators. Constant development work assures the adaptability of the Purolator line to both old and new engine designs, on both land and sea.

PUROLATOR PRODUCTS, INC., formerly Motor Improvements, Inc., Newark, New Jersey

Another NORDBERG Gas Burning DIESEL

In addition to these two 1500 horsepower gas burning Nordberg Diesel Engines at the Carlsbad New Mexico Plant of the Potash Company of America, a third Nordberg unit of 750 horsepower is also in operation. A fourth gas burning unit as shown at the right is now to be added, this having six cylinders and is 2400 horsepower in size.



When in need of additional power, investigate the advantages of Nordberg Diesel power. If natural gas is available, the dual fuel burning engine offers an additional advantage in substantial fuel savings and greater profits. Whether arranged for either oil or gas burning, you can depend on Nordberg Diesels to give reliable and economical service.

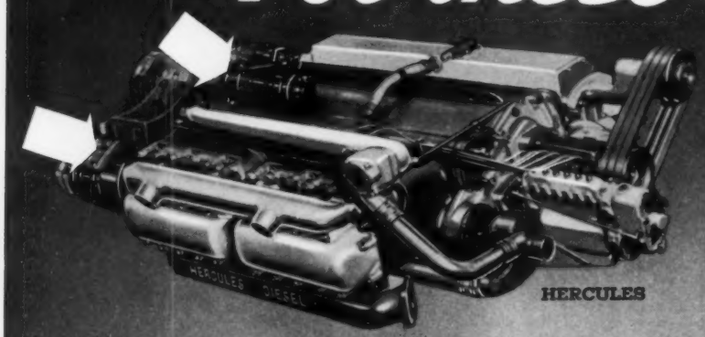
The Potash Company of America has ordered its fourth Nordberg Diesel. In 1936, the first Nordberg unit of 750 horsepower was placed in service. The following year, and again in 1939, 1500 horsepower Nordberg Engines were added. All three engines were originally arranged to burn oil but have since been converted to natural gas burning. This newest engine of 2400 horsepower is also arranged for gas burning and, like the other three, can be changed to oil burning at any time. Changing from one fuel to the other is accomplished quickly and without change of any major engine parts. Since Nordberg Dual Fuel Burning Engines operate on the full-Diesel principle, the high efficiency of the Diesel Engine is always maintained. *It is the most efficient gas burning engine built in the United States.*

NORDBERG MFG. CO., MILWAUKEE

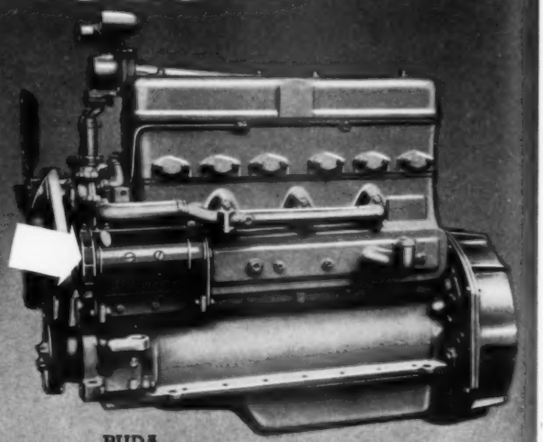
NEW YORK WASHINGTON CLEVELAND KANSAS CITY DALLAS LOS ANGELES

DELCO-REMY DEPENDABILITY

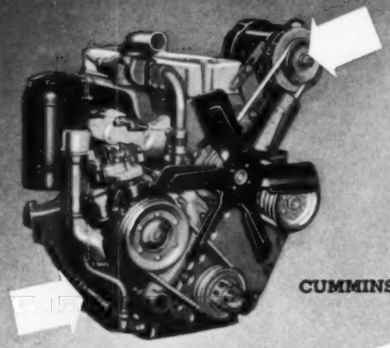
For these Diesels



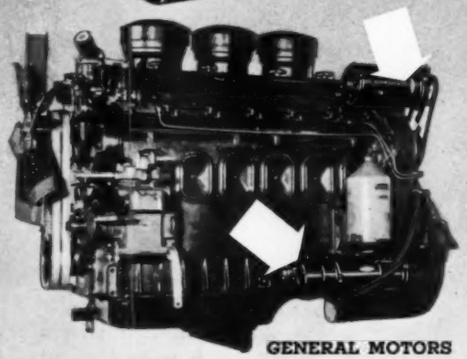
HERCULES



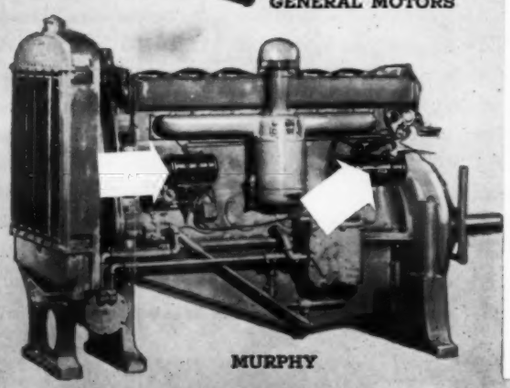
BUDA



CUMMINS



GENERAL MOTORS



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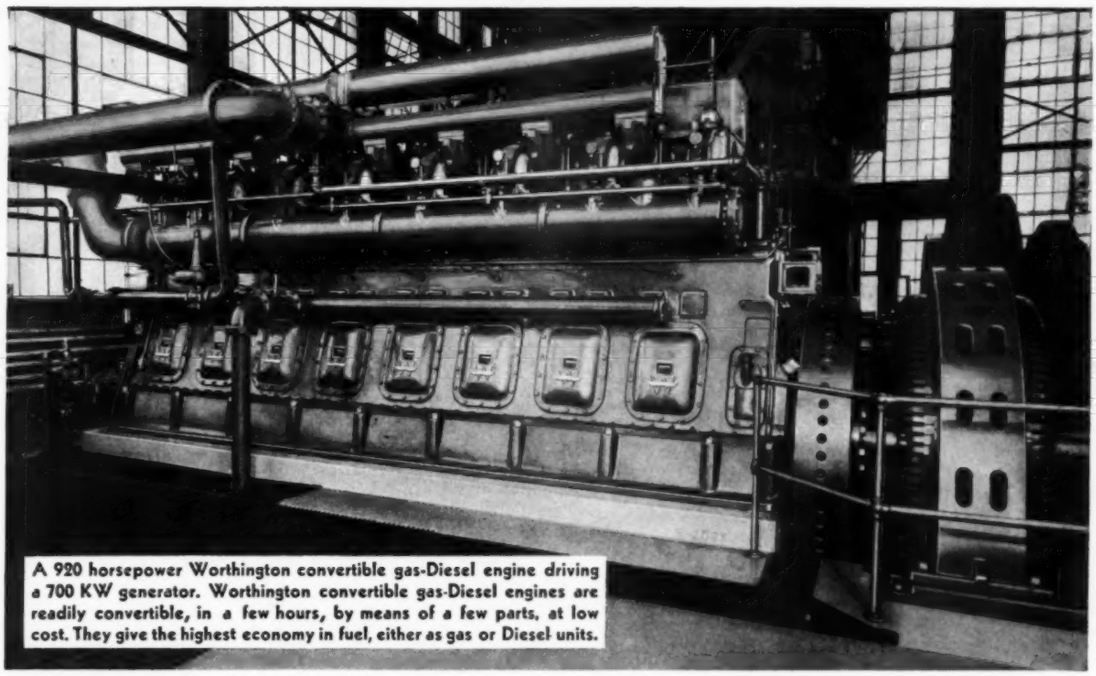

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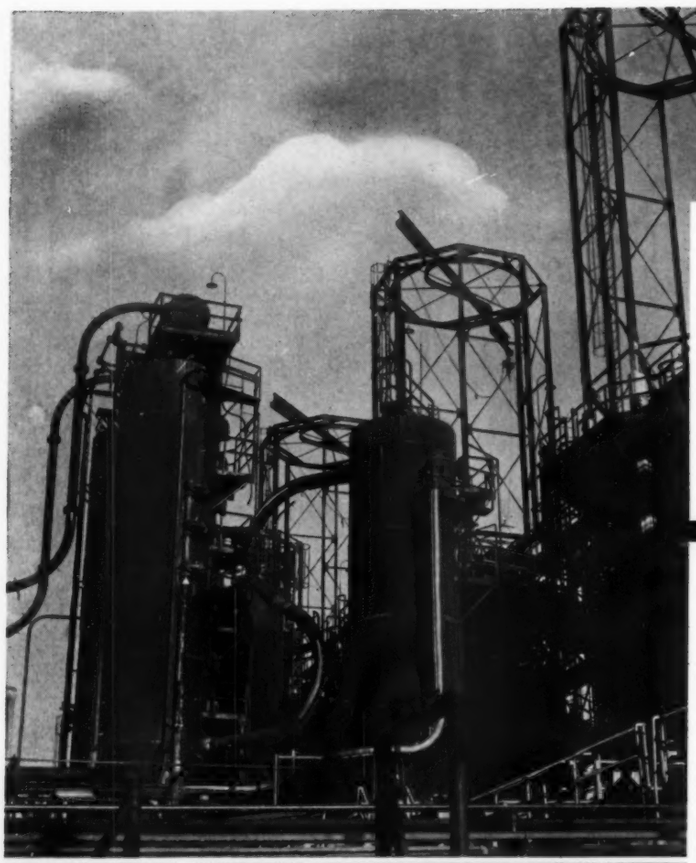

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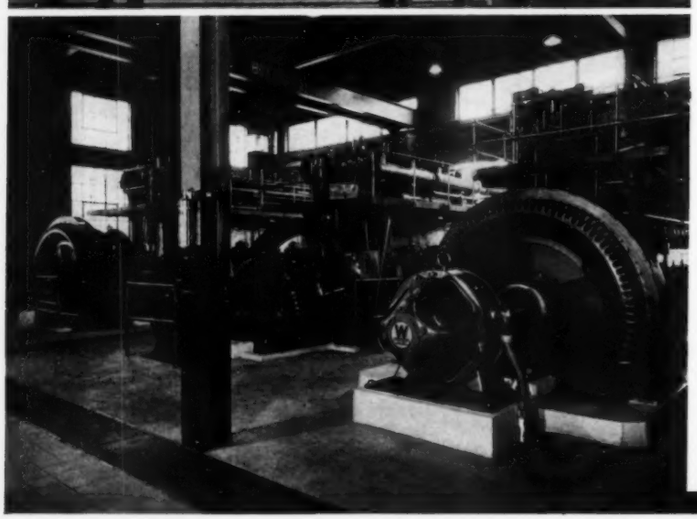

(Left) **1000 h.p. BUSCH-SULZER,** *750 h.p. Fulton and 500 h.p. Fulton Diesels operated by Easton Utility Commission, Easton, Md. All are Sinclair lubricated.*

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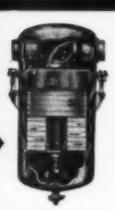

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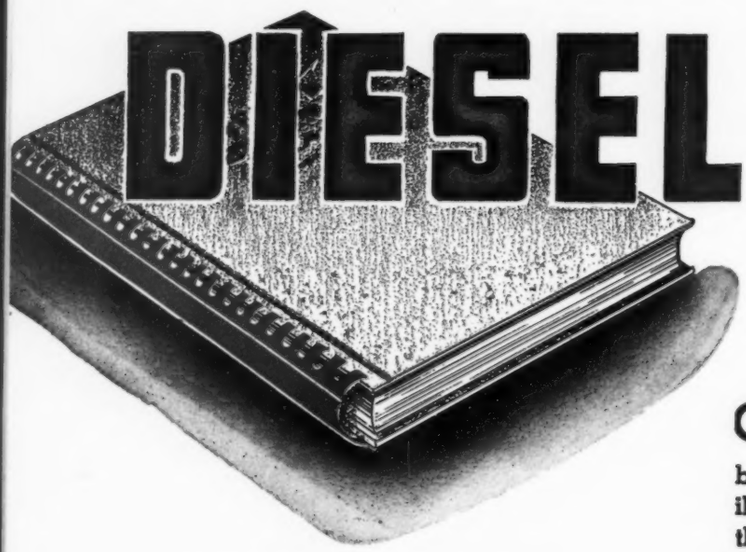

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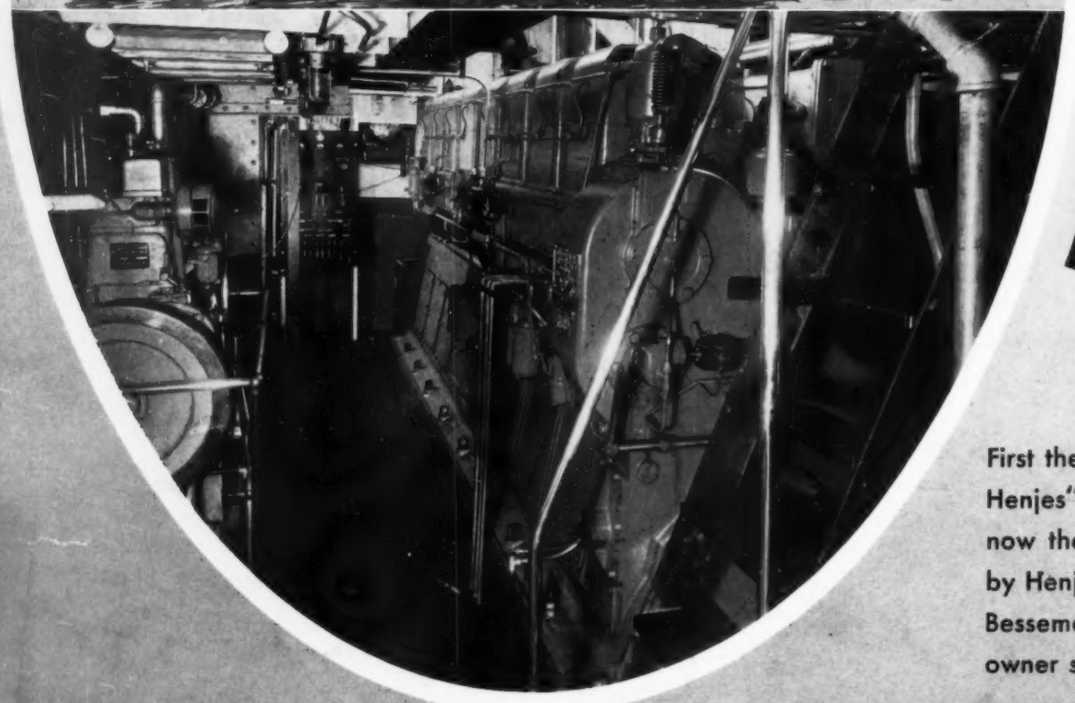

Top—Tug "Gerd H. Henjes", recently placed in service by her owners, Henjes Marine, Inc.

Above—A 500-hp Cooper-Bessemer Diesel powers the "Gerd H. Henjes". Like all Type JS Diesels, it has oil-cooled pistons, patented Cooper-Bessemer fuel system and T-type wrist-pins among its many features.

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